

Traffic Study
of the
Proposed Logistics Park
in Johnson County, KS



Prepared for BNSF
March 14, 2006



4435 Main Street, Ste. 1000
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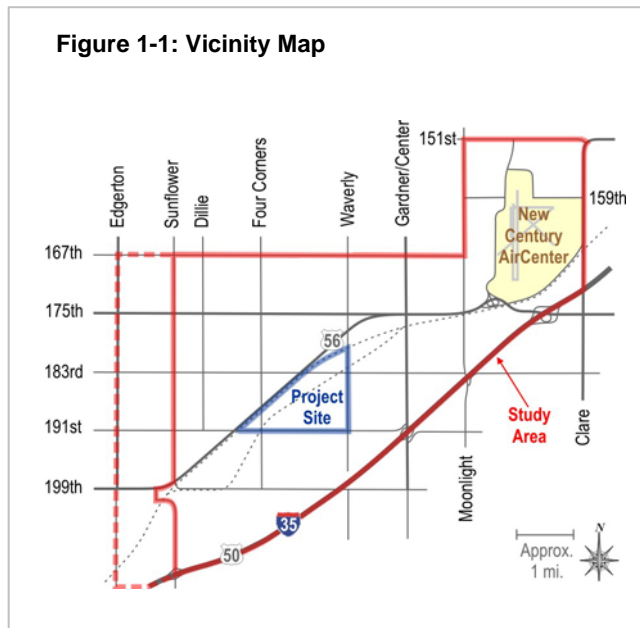
1. Introduction/Executive Summary

HDR has been retained by BNSF to perform a traffic study of the proposed Logistics Park Intermodal Facility near the City of Gardner, Kansas. The site would be approximately bounded by 191st Street to the south, Waverly Road to the east, and US-56 to the north and west. Figure 1-1 illustrates the project location in the context of the surrounding vicinity.

The purpose of the study was to investigate the expected long-term traffic impacts of the proposed facility, and to recommend a series of improvements to the local roadway/highway system to accommodate the proposed development while meeting local and regional transportation objectives.

Through use of the City of Olathe's travel demand forecasting model, and consultation with affected agencies - including the City of Gardner, Johnson County, and KDOT- the following recommendations were developed:

- In conjunction with the proposed intermodal facility and associated warehouse/distribution facilities, grade separations should be developed on both Waverly Road and 199th Street, crossing the BNSF tracks. Further, the intermodal facility should be designed not to preclude grade-crossings at both 191st Street and Four Corners Road. Such crossings are not warranted by current traffic projections, but may eventually serve local and regional needs. Finally, the existing at-grade crossing at 183rd Street should be closed in conjunction with the proposed intermodal facility.
- Also in conjunction with the proposed facility and associated developments, improvements will be needed on 191st Street, Waverly Road, Center Street, and 199th Street.
- Several key facilities were identified as in need of future improvements whether or not the Logistics Park and associated uses are built: I-35 mainline north of Gardner Road, US-56 from Center street to I-35 (and beyond), Center Street/Gardner Road between 183rd Street and I-35, and Old US-56 north of the study area.
- A grade-separated White Drive crossing of the BNSF tracks would serve to relieve the existing Moonlight Road at-grade crossing. With proper development of White Drive to serve local circulation, it is recommended that the Moonlight Drive crossing be closed.
- Development of more refined transportation planning tools for the area between Gardner, Edgerton, and DeSoto is highly recommended. Future planning for these areas will have a significant impact on regional transportation system needs.



2. Existing Setting/Conditions

Vehicular Transportation

Figure 2-1 illustrates the existing vehicle transportation network in the site vicinity, including existing daily traffic volumes on key facilities. Key transportation facilities are briefly described below.

- Regional access to the study area occurs via **I-35**, a four-lane north-south interstate highway that locally runs diagonally northeast-southwest. I-35 carries approximately 42,000 vehicles per day (vpd) north of US-56, and 20,000 to 26,000 vpd in the southern portion of the study area.
- In the study area, **US-56** roughly parallels I-35 as much as 2 to 3 miles to the north of I-35, although the two facilities intersect at the east end of the study area. US-56 runs through the commercial center of Gardner as a four-lane undivided facility, and is largely fronted by business and retail uses before it splits with 175th Street (see below). West and south of the split, US-56 runs through largely undeveloped/agricultural areas as a two-lane facility. Traffic volumes on US-56 range from 16,000 to 19,000 vpd in Gardner proper; to the west, where US-56 diverges from 175th Street and turns southwest, it carries much lower volumes – on the order of 4,000 vehicles per day.
- **Center Street**, known as **Gardner Road** outside Gardner, is a two- to four-lane north-south roadway that spans the study area. Center Street is one of only two grade-separated crossings of the BNSF tracks in the study area (a two-lane bridge) – the other is US-56 east of New Century Parkway – and also provides one of only two interchanges with I-35 in the study area (the other being US-56). Center Street connects some of Gardner's newer residential areas with US-56 and the downtown area. It carries 4,000 to 5,000 vpd between US-56 and I-35, and 3,000 to 4,000 vpd between I-35 and 199th Street.
- **Moonlight Road** is a two-lane north-south roadway that carries 7,000 to 10,000 vpd near US-56, and much lower volumes (1,000 to 2,000 vpd) in the southern portion of the study area. Moonlight Road crosses the BNSF tracks at-grade, and overpasses I-35 but has no interchange.
- **175th Street**, known as **Main Street** through the center of Gardner, coincides with US-56 from roughly I-35 to a point approximately one-half mile west of Center Street. West of this split, it is a two-lane east-west road providing access to a few residential developments as well as a number of undeveloped/agricultural parcels. From the split to Waverly Road, it is known as **Santa Fe Street**. On the portion west of the split, Santa Fe Street carries 3,000 to 4,000 vpd; west of Waverly Road, 175th Street carries roughly 1,000 vpd, decreasing to the west.



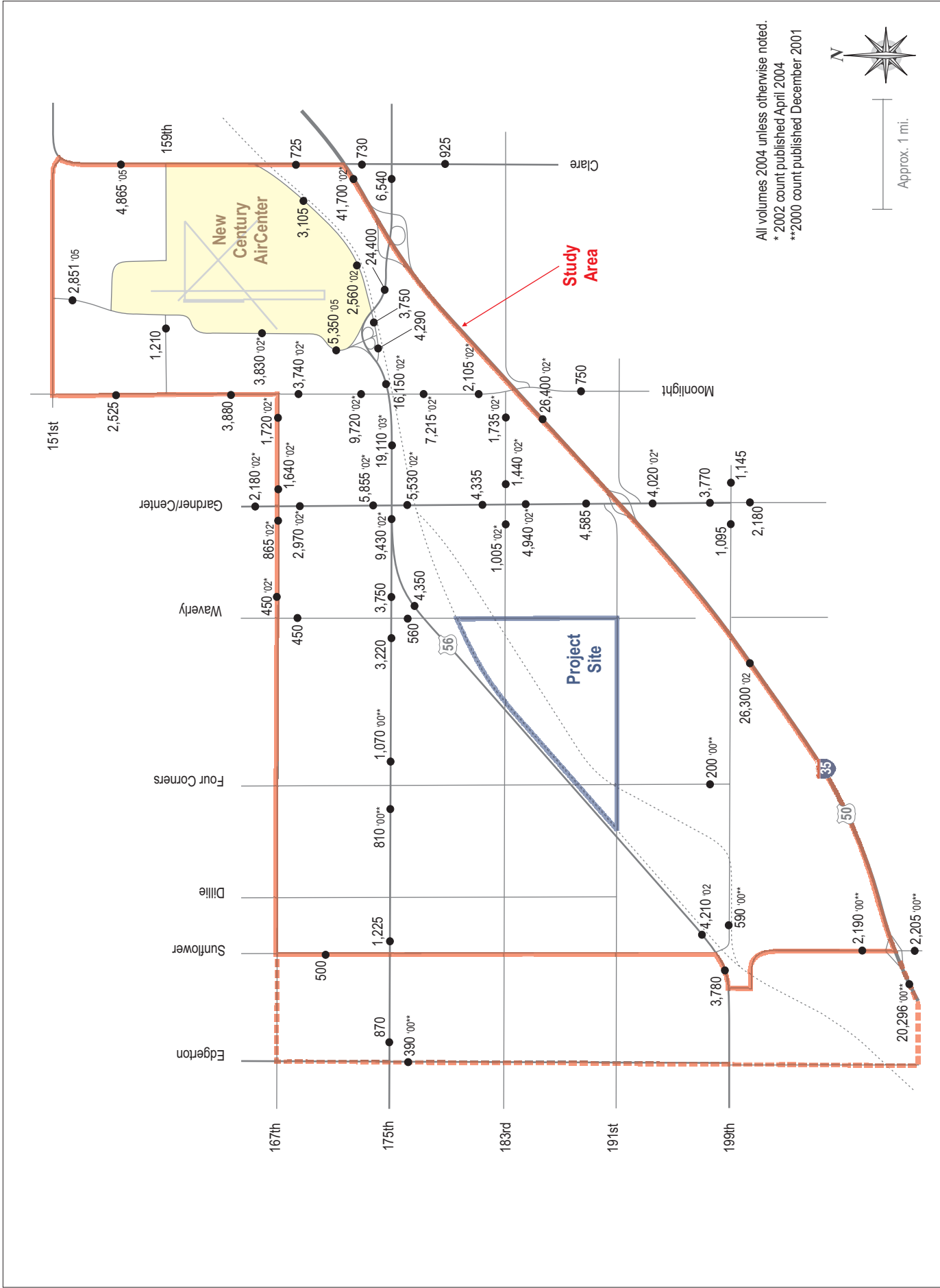


Figure 2-1: Existing Average Daily Traffic (ADT)

- Within the study area, **Waverly Road** is primarily a north-south gravel road that provides access to largely undeveloped/agricultural parcels. Waverly Road has two at-grade crossings of the BNSF tracks between US-56 and 183rd Street. North of US-56, Waverly Road provides access to two schools: Gardner Edgerton High School and Madison Elementary School. In the study area, Waverly Road carries less than 1,000 vpd.
- Within the study area, **Four Corners Road** is a north-south paved two-lane road that, like Waverly Road, provides access to largely undeveloped/agricultural parcels. There are two at-grade crossings of the BNSF tracks on Four Corners Road between US-56 and 191st Street. Four Corners Road currently terminates at 199th Street, and carries less than 1,000 vpd in the study area.
- Further to the west, **Sunflower Road** and **Edgerton Road** are north-south facilities that provide access to the City of Edgerton. Both are currently low-volume two-lane roads.
- In the study area, **183rd Street** is an east-west gravel road that serves largely undeveloped/agricultural areas. In the vicinity of Center Street, 183rd Street provides access to several small residential developments and carries 1,000 to 2,000 vpd. There are two at-grade crossings of the BNSF tracks on 183rd Street between US-56 and Waverly Road.
- In the study area, **191st Street** is primarily an east-west gravel road – like 183rd Street, serving largely undeveloped/agricultural areas. West of Waverly Road, 191st Street is paved. 191st Street is discontinuous at Four Corners Road, so it only has one at-grade crossing of the BNSF tracks between US-56 and Four Corners Road. 191st Street is also discontinuous at Gardner Road, with a separation occupied by the I-35/Gardner Road interchange. Count data is not available for 191st Street, but it is a low-volume facility. 188th Street, a portion of which has been built north of 191st Street intersecting Center Street from the west, may ultimately serve as a future alignment for 191st Street (see discussion later in this report).
- In the study area, **199th Street** is an east-west two-lane paved road that serves largely undeveloped/agricultural areas. At the west end of the study area, near Edgerton, 199th Street bends north, crosses one BNSF track at-grade, and becomes Sunflower Road. At the east end, 199th Street currently overpasses I-35 with a two-lane bridge and no interchange.



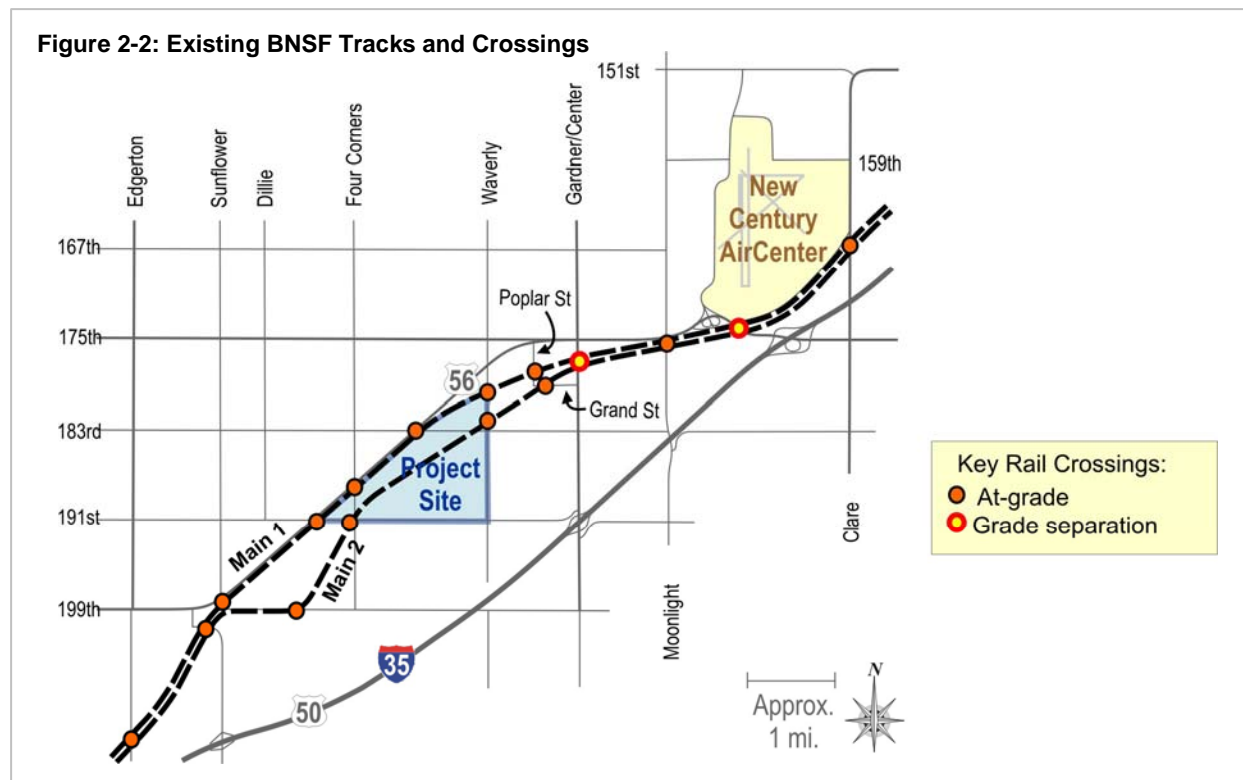
Rail Transportation

As Figure 2-2 illustrates, two BNSF tracks currently traverse the project site and study area:

- **Main 1** generally runs parallel to and just southeast of US-56 from 199th Street through to the east end of the study area. From roughly 183rd Street to Moonlight Road, it is offset from US-56 by up to 1,700 feet.
- **Main 2** runs parallel to and just south of 199th Street from Sunflower Road about halfway to Four Corners Road, then turns northeast and roughly parallels US-56 a quarter-mile or more to the south.
- On the northeast end, the two Mains “converge” and run parallel from a point just west of Center Street through to the east end of the study area. On the southeast end, they converge and run parallel from a point south of 199th Street through to the southwest edge corner of the study area.

Currently, 70 trains per day (35 eastbound, 35 westbound) travel on the BNSF tracks through the study area. Trains travel at 55 to 70 mph (depending on train type and contents) and are 8,000 feet long, on average. As Figure 2-2 also illustrates, there are 14 at-grade BNSF rail crossings in the study area, and 2 grade-separated crossings. Four of the at-grade crossings are double-track crossings.

Worthy of note is the existing BNSF intermodal facility at the Argentine Yard, located near I-635 south of the Kansas River in Kansas City, Kansas, approximately 27 miles (“as the crow flies”) northeast of the proposed Logistics Park site. This site provides similar functions to the proposed Logistics Park. Many of the operations at the Argentine intermodal facility would be relocated to the Logistics Park site.



Agency Perspectives

Meetings were held with Johnson County, the City of Gardner, the City of Olathe, and KDOT to solicit those agencies' input and concerns related to the transportation impacts of the proposed Logistics Park. Issues discussed include the following, listed by agency:

CITY OF GARDNER

- The City would prefer to keep site-related trucks off US-56 through town. A more direct route to I-35 is desirable.
- There is an existing weigh station on I-35 north of US-56. The City has indicated that trucks "cut through" Gardner (using US-56 and Old US-56) to avoid the scales, and has indicated concerns about this practice continuing in the future.
- The City considers Waverly Road an important future north-south connector. It provides access to schools as well as areas of future development.
- The City is planning ultimately to realign 191st Street in the vicinity of Gardner Road. On the west side, an alignment along 188th Street (a quarter-mile of which is already partially built) is planned. The realignment would provide a more desirable separation between the Gardner Road interchange and 191st Street, improving operations in the long term as traffic volumes increase.
- Center Street is the only north-south grade-separated crossing of the BNSF tracks in Gardner. The crossing is currently a two-lane bridge, but the City anticipates the possible need to expand to four lanes in the future.
- The existing at-grade crossing at Moonlight Road is planned to be improved in 2008, although it is currently planned to remain at-grade. The City hopes to meet Quiet Zone requirements.

JOHNSON COUNTY

- The County's Comprehensive Arterial Roadway Network Plan (CARNP) shows 199th Street as a major route in the future.
- The County considers Four Corners Road an important future north-south connector.
- Edgerton Road is shown in the CARNP as a major future north-south connection to K-10 and the City of Desoto.
- The County submitted a proposed 199th/I-35 interchange concept to KDOT as a System Enhancements project in the late 1990s. The project wasn't selected, and hasn't moved past the concept stage.

KDOT

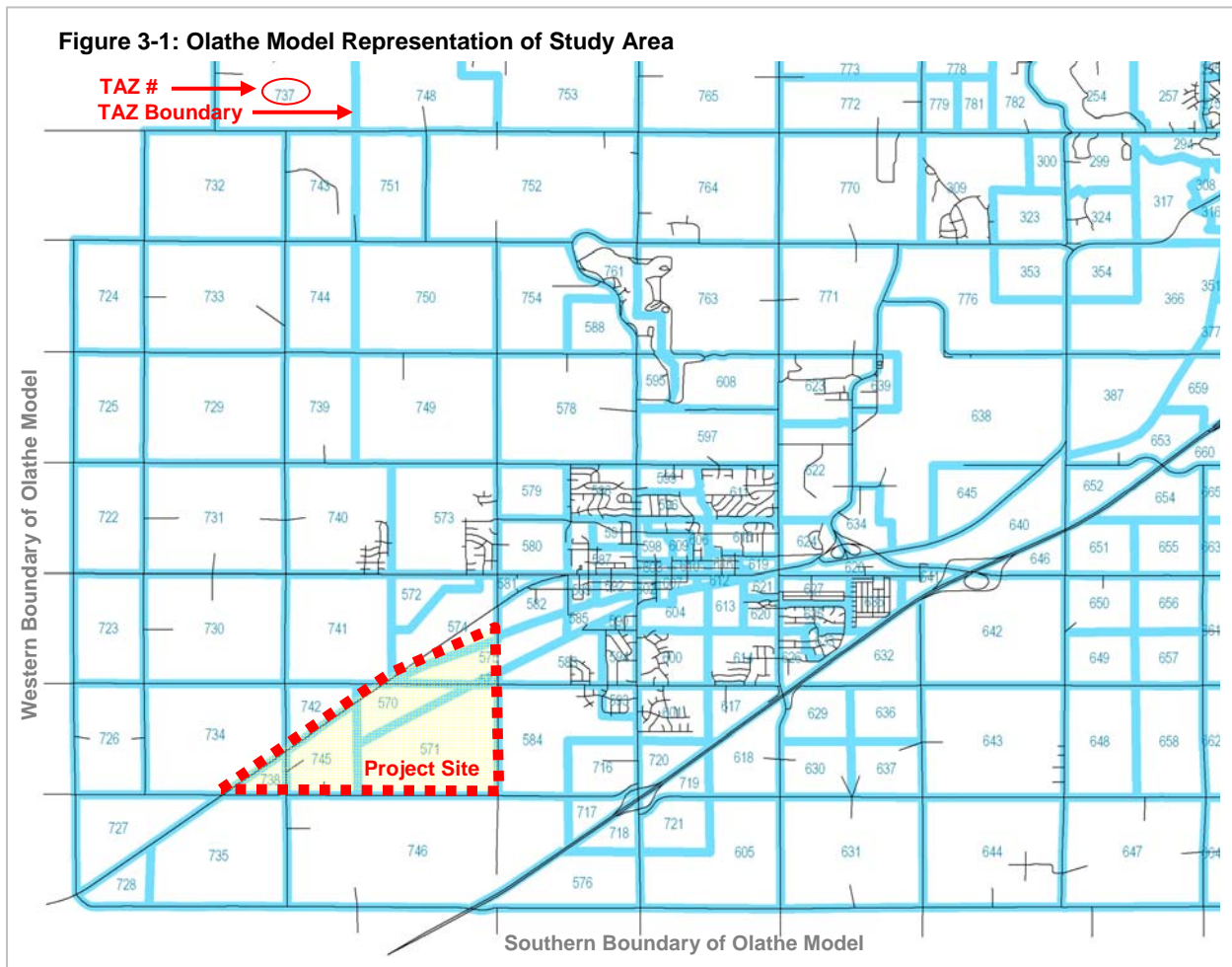
- Due to the proximity of I-35 to the site, it is important to maintain a dialogue with KDOT as the project progresses. Any new interchange proposed for I-35 would need to follow FHWA guidelines and a "break in access" study would ultimately be required before approval.
- A new interchange could also mean that Mid-America Regional Council (MARC), the Kansas City MPO, would need to amend the long-range transportation plan for the region.
- Regarding the weigh station on I-35 north of US-56, KDOT staff indicated it has always been an issue when the potential for future widening on I-35 has been discussed, because it would be impossible to widen I-35 without impacting the weigh station. Kansas Highway Patrol has jurisdiction over the weigh station.
- If the I-35/Gardner Road interchange were to be used for temporary/interim access, KDOT would like to see related interchange improvements coordinated with upgrades planned in conjunction with future commercial development near the interchange.
- Coordination and communication with the New Century and Gardner Municipal Airports may be advisable if interface with air freight is planned. KDOT staff participates in long-range planning activities for regional airports.

3. Study Methodology

Traffic Forecasting

MODEL DESCRIPTION. The primary tool used to evaluate the potential future transportation impacts of the proposed Logistics Park was the City of Olathe's travel demand forecasting model. The model, using the TransCAD software, covers an area about 14 miles long (north-south) and 15 miles wide (east-west). The overall approximate model limits are 87th Street/83rd Street to the north, Quivira Road to the east, 191st Street to the south, and Sunflower Road to the west. The model divides the region into 782 internal Traffic Analysis Zones (TAZs), which allow existing and future land-use/socioeconomic information to be grouped into reasonably sized areas. These TAZs are joined to the roadway network by links known as centroid connectors, and the model - through an iterative process - generates, distributes, and assigns traffic to the network utilizing the socioeconomic information. In addition to the 782 internal TAZs, the model includes 72 external zones that represent traffic leading in and out of the model (such as I-35 south of 191st Street).

STUDY AREA REPRESENTATION. The entire City of Gardner is contained within the Olathe model, as is the entire site of the proposed Logistics Park. The study area for this project is covered by 80 TAZs, including 6 TAZs that comprise the Logistics Park site. The western boundary of the model generally follows Sunflower Road, and the southern model boundary follows 199th Street. Figure 3-1 illustrates the modeled transportation network and TAZs in the study area.



FORECAST SCENARIOS. The Olathe model has been developed with four basic scenarios: (1) Existing (2004) conditions, (2) 2010 conditions, (3) 2015 conditions, and (4) Buildout (assumed 2050) conditions. For this study, the model was used to examine two scenarios:

- *Existing Conditions:* Although the overall model has been calibrated and validated for existing conditions, additional checks were made in the study area to compare modeled “existing” conditions to actual available traffic counts. This process is described in Appendix A.
- *2025 Conditions:* For long-term forecasting in this study, the review agencies desired a 2025 horizon year. The 2025 scenario was developed by interpolating between the model’s 2015 and 2050 socioeconomic data, and refining these data locally in consultation with Johnson County, the City of Gardner, and the City of Edgerton. This process is also described in Appendix A.

Capacity Analysis

For the purposes of this study, the volume-to-capacity (v/c) ratios reported by the Olathe model were used as planning-level indicators of future operations. A v/c ratio of 1.0 indicates that a facility is operating at capacity. Ratios exceeding 1.0 indicate that capacity is insufficient to accommodate forecasted demand.

4. 2025 “No Build” Traffic Modeling

To establish a base case against which to compare future alternatives, a 2025 “No Build” traffic model scenario was created that included future growth but excluded the intermodal facility and associated development. The elements of this scenario are described below:

- **Land Use:** As mentioned previously, the first step in developing the 2025 land-use assumptions was to interpolate between the 2015 and 2050 land-use contained in the Olathe model. Once this was completed, the City of Gardner made some adjustments to the local area land-use assumptions to (1) better reflect Gardner’s long-term plans, and (2) to account for the expectation that future industrial development would largely take place on the west side of I-35, not the east side as previous area plans have shown. This second assumption anticipates the future intermodal facility and associated warehouse/distribution uses, but does not explicitly include them. No land-use (beyond existing) was included in the TAZs constituting the intermodal site. The local land-use assumptions are illustrated in Appendix A.
- **Roadway Network:** In the study area, the roadway network included in the Olathe model was the same for both the 2015 and 2050 scenarios, so it was used without modification.
- **External Traffic Growth:** In examining preliminary results of the Olathe model, it was noted that forecasted growth rate on I-35 at the south end of the study area (an “external station” in the model) was fairly flat – on the order of 1 percent per year. Other local external stations, such as US-56 at the southwest corner of the model, showed similarly flat growth rates. Historical growth trends on these facilities are much higher. Based on an examination of growth rates in the local area, it was decided to adjust the local external stations to reflect a growth rate of 2.8 percent per year. Figure 4-1 illustrates the results of these adjustments for I-35 and US-56.

Figure 4-1:
Adjusted External Growth Forecasts
(compared with historical growth)

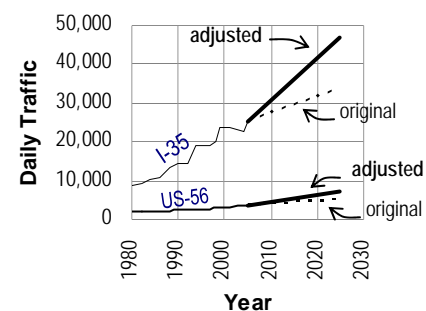
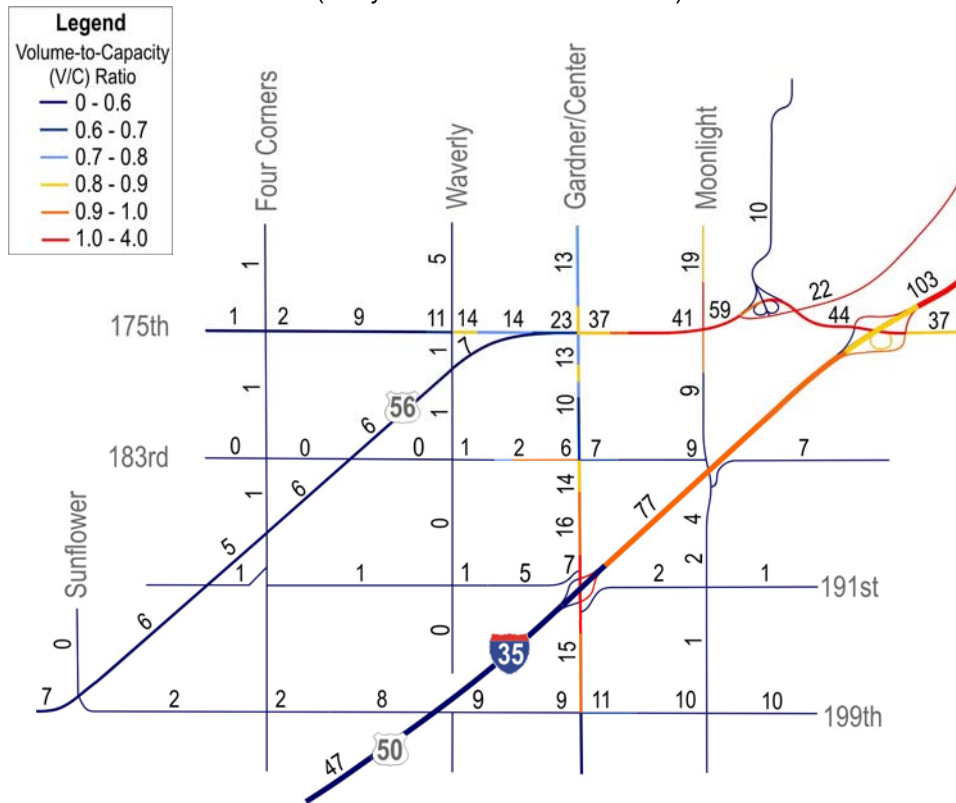


Figure 4-2 illustrates the results of the 2025 “No Build” model, both traffic volumes and daily v/c ratios. As the figure illustrates, some key facilities in the study area are forecasted to operate near or above capacity by 2025. These include:

- **I-35:** North of US-56, I-35 is forecasted to operate above the daily capacity of a four-lane facility. From US-56 to Gardner Road, I-35 is forecasted to operate just at capacity. These results indicate a need for six lanes on I-35 north of Gardner Road in the future.
- **US-56:** From Gardner Road to I-35 and beyond, US-56 is forecasted to operate above capacity. Projected traffic volumes, on the order of 37,000 vehicles per day (vpd) to 59,000 vpd, indicate a need for future capacity enhancements – potentially widening to six lanes.
- **Old US-56:** From US-56 heading north out of the study area, Old US-56 is forecasted to operate above the capacity of its current two-lane configuration, indicating the need for widening to four lanes.
- **Gardner Road:** From 183rd Street to 199th Street (including the interchange with I-35), Gardner Road is forecasted to operate near or above the capacity of its current 2-lane configuration, indicating the need for four lanes. A portion of this segment of Gardner Road has already been widened, but the 2025 “No Build” scenario indicates the need for continuous improvements over the entire section.

In summary, the 2025 “No Build” scenario indicates several future capacity issues in the eastern portion of the study area regardless of the development of the intermodal site and associated land-uses.

Figure 4-2: 2025 “No-Build” Model Forecasts
(Daily Traffic Volumes in 000's)



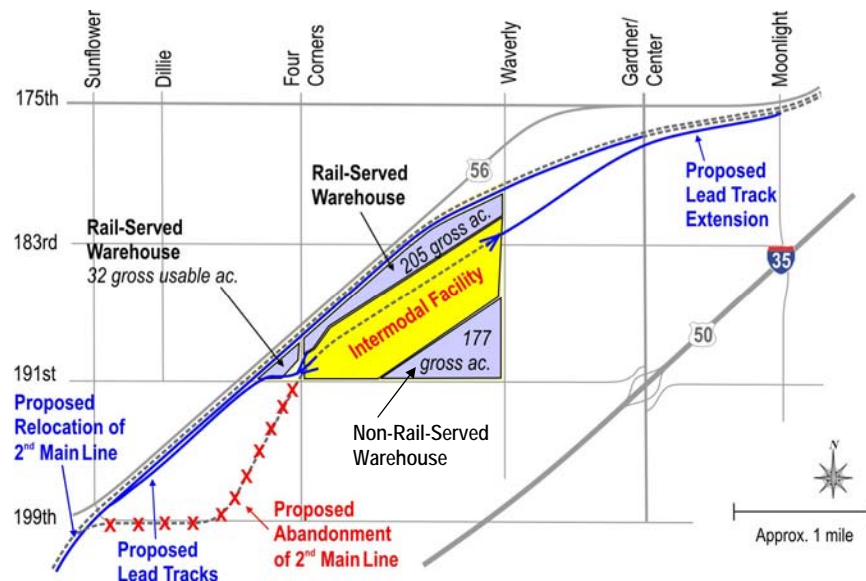
5. Project Description

The Logistics Park site would be approximately bounded by 191st Street to the south, Waverly Road to the east, and US-56 to the north and west. The site would include an intermodal facility, where goods (primarily arriving from the West Coast) would be transferred from train to truck (and vice versa). Warehouse and distribution facilities on-site would also support goods movement.

Site Layout

Figure 5-1 contains a preliminary overview of the proposed project site layout. This layout is subject to change, but illustrates the basic proposed components of the project:

Figure 5-1: Conceptual Site Overview



- **Track Configuration:** The current site plan shows that, east of existing Four Corners Road, BNSF's existing Main 2 track would be converted to become part of the intermodal yard. A new Main 2 would be constructed – parallel and adjacent to the existing Main 1 track – between Nelson Street in Edgerton, where the two existing mains currently diverge, to tie in with existing Main 2 east of Gardner Road. Existing Main 2 from Nelson Street to Four Corners Road would be abandoned. Many other tracks would be constructed on-site, for storage, queueing, and other purposes, as shown on the site plan.

From the south, two lead tracks would be constructed that would allow 8,000 feet of storage each. These tracks would start in the vicinity of 199th Street, and would parallel the main tracks until after crossing 191st Street. They would then turn east and run parallel to 191st Street on the north side until entering the intermodal facility. Trains would stop on these lead tracks, blocking 191st Street for significant amounts of time.

- **Intermodal Operations:** The site is planned to accommodate 1,000,000 annual “lifts” by the year 2025. A lift is defined as moving a container from train to truck or vice versa. Initial operations would probably be closer to 500,000 lifts per year. (As a point of reference, the existing Argentine intermodal facility in Kansas City, Kansas experiences approximately 300,000 lifts per year.)

- *Rail-Served Warehouse Facilities:* In addition to the intermodal facilities, the northwestern portion of the site is anticipated to contain rail-served warehouse facilities, which would facilitate movement of non-containerized rail freight onto trucks. Items transported by boxcar - such as bulk goods, lumber, or furniture – would pass through these facilities.
- *Non-Rail-Served Warehousing and Distribution Centers:* It is anticipated that non-rail-served warehouse and distribution centers would be built on the southeast portion of the site. Containers would be “hostlered” (moved by on-site trucks) between rail and these facilities.

Operational Characteristics

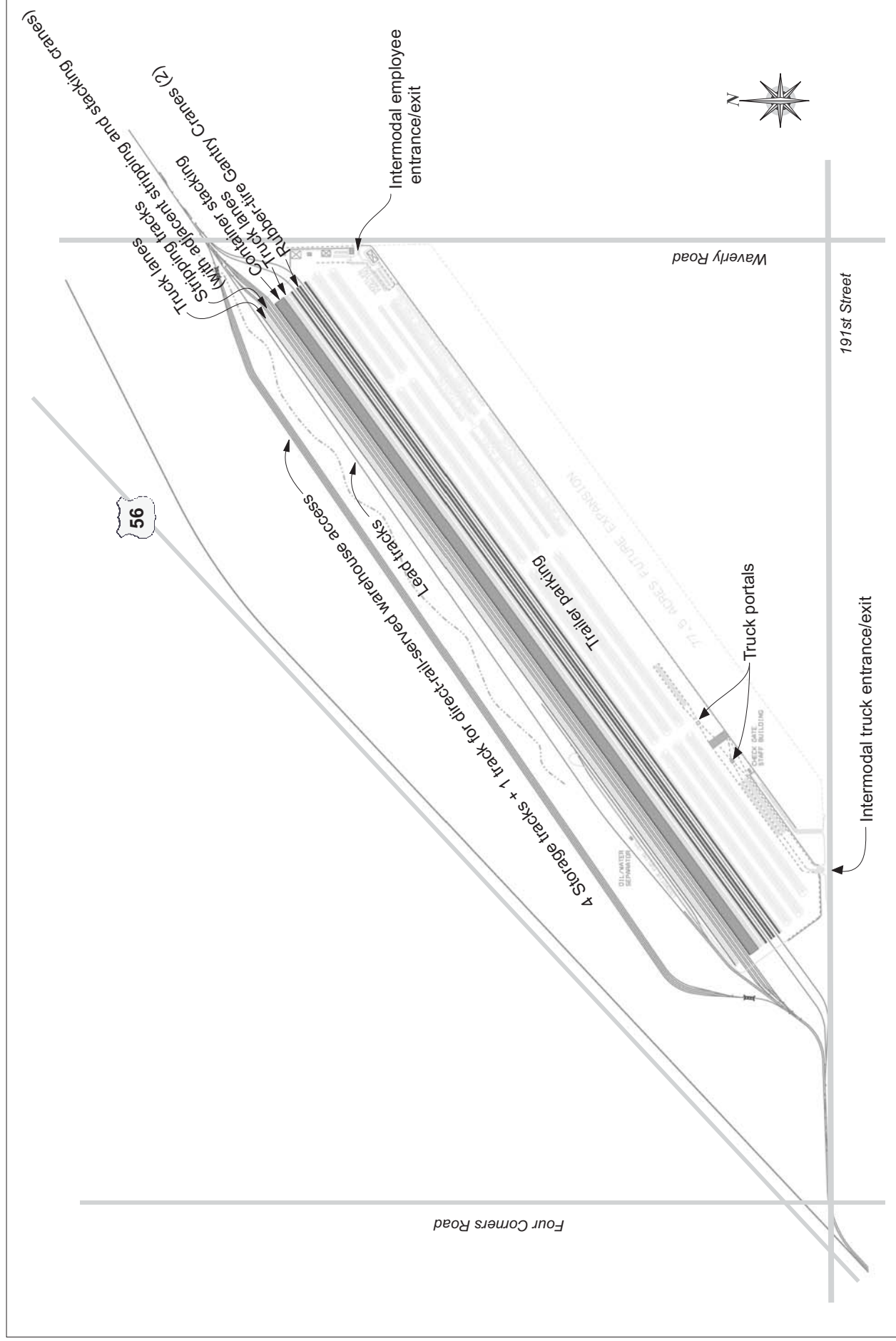
INTERMODAL TRUCK ACCESS. BNSF proposes that inbound and outbound trucks using the intermodal facility will enter and exit via a common access point. Operations will be 24 hours a day. Incoming trucks will initially pass through an automated gate with an average processing time of 3 minutes. Once a truck has passed through the gate, it will be subject to additional internal processing. Multiple entry gates would be provided to streamline processing and prevent queueing back onto the local street system. The location of this access point and its effects on the project’s traffic impacts are described in Section 5 of this report.

INTERMODAL EMPLOYEE ACCESS. Employee access to the intermodal site would be separate from the truck access for security and operational reasons. The intermodal facility is expected to initially employ approximately 150 people, equally divided over 3 shifts. Therefore, the maximum number of employees expected to be on-site at any given time would be 100 as shifts overlap. By 2025, the intermodal facility is expected to employ nearly 300 people.

WAREHOUSE/DISTRIBUTION ACCESS. The warehouse/distribution components shown in Figure 5-1 would also generate employee/truck traffic. It is expected that employee access and truck access to the local street system would be at common points, in order to minimize the amount of driveways/roadways intersecting local streets. Access is discussed in more detail later in this report.

TRAIN OPERATIONS. Several additional operational characteristics are relevant to the analysis of the site’s impact:

- *Train Volumes:* BNSF anticipates initially that 6 trains per day would use the intermodal facility. By 2025, this would increase to 30 trains per day. The total train traffic through the study area is expected to increase to as much as 140 trains per day by 2025 (including the 30 stopping at the Logistics Park site). This volume represents the maximum capacity of the two main tracks.
- *Train Speeds:* Trains on the main tracks (about 79 percent of the trains through the study area) are expected to continue to travel at 55 to 70 mph. Local speeds for trains accessing the intermodal facility will be slower than they are through the study area today. Trains arriving at the Logistics Park facility will travel at restricted speeds - a maximum of 10 to 15 mph within the site, and 28 mph approaching the site (dictated by the curvature of the turnout). Exiting trains will travel at 10 to 15 mph until the train’s back end clears the site, after which the train speed will be controlled by the turnout (28 mph). According to BNSF, almost every train stopping at the intermodal facility will be traveling to and from the southwest; therefore, existing at-grade crossings near downtown Gardner will be largely unaffected by slower-speed trains.
- *Train Lengths:* By 2010, BNSF anticipates that the average train length could potentially increase from its current value of 8,000 feet. This would further impact blocking times at at-grade crossings.



TRIP GENERATION AND LAND USE. Table 5-1 summarizes the expected trip generation for the intermodal facility and associated warehouse/distribution uses. The components of the trip generation assumptions are described below. Appendix B contains more details regarding trip generation.

Intermodal Facility

The intermodal facility will generate truck trips and employee trips.

To determine expected truck volumes, the ultimate figure of 1,061,000 annual lifts (year 2025) was used as a starting point. Annual lifts are expected to increase fairly linearly over time from an initial 483,000 lifts to the million-plus figure. Based on correlations between lifts and truck trips reported at the existing Argentine Yard, factors were developed to convert annual lifts to daily and peak-hour truck volumes. The derivation of these factors is included in Appendix B. As Table 5-1 indicates, in 2025 the intermodal facility is expected to generate 4,003 truck trips per day, 280 during the p.m. peak hour.

The intermodal facility is expected to have 288 employees by 2025. Ramp operation employees, comprising about 80 percent of the workforce, would have shift changes 2 times per day. The remaining employees would have shift changes 3 times per day. As Table 5-1 indicates, in 2025 the intermodal facility is expected to generate 576 employee trips per day. Shift changes would not occur during the p.m. peak hour, so the table shows no employee trip generation during that hour.

Table 5-1: Trip Generation Assumptions, Intermodal Facility and Associated Warehouse/Distribution Development

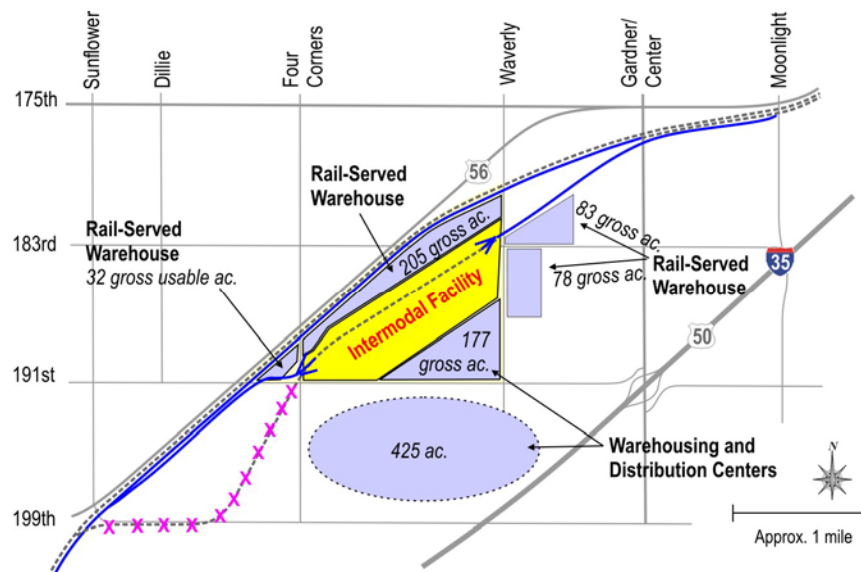
	Size	Daily Trips	P.M. Peak-hour Trips
Opening Year (2009)			
Intermodal Trucks	483,000 annual lifts	1,822	128
Intermodal Employees	143 employees	286	0
On-site Warehouse	850,000 square feet	3,828	409
Off-site Warehouse	-	-	-
Total on-site trip generation		5,936	537
Total off-site trip generation		0	0
Total trip generation		5,936	537
Year 2025			
Intermodal Trucks	1.061 million annual lifts	4,003	280
Intermodal Employees	288 employees	576	0
On-site Warehouse	4.65 million square feet	21,312	2,273
Off-site Warehouse	7.60 million square feet	33,918	3,612
Total on-site trip generation		25,891	2,552
Total off-site trip generation		33,918	3,612
Total trip generation		59,809	6,164

Appendix A contains more detailed trip generation assumptions and information.

Associated Warehouse/Distribution Uses

Figure 5-3 illustrates assumed areas of future warehouse/distribution facilities, both on and off the site, that would be associated with the intermodal facility. An economic study has been conducted based on the assumption that 1,000 acres of such facilities would develop over a 12-year period as a result of the intermodal facility. No such uses are currently proposed as part of the intermodal site, but they are anticipated as part of future planning and are therefore included in the transportation model. As can be gleaned from Table 5-1, these 1,000 acres are expected to develop into nearly 12 million square feet of building space. Some of these uses were assumed to develop immediately adjacent to the intermodal facility on the study site, while a large portion were assumed to develop south of 191st Street.

Figure 5-3: Associated Warehouse/Distribution Development Assumptions



6. Initial Modeling of Transportation Infrastructure Alternatives

Network Alternatives

To examine the transportation impacts of the proposed Logistics Park, several network alternatives were initially developed that included combinations of road closures, grade separations, new or improved interchanges, and access provisions. These alternatives were analyzed using the traffic model in order to compare their impacts. Table 6-1 summarizes the alternatives in matrix form; Figure 6-1 illustrates them graphically.

The alternatives, developed in consultation with the reviewing agencies, were designed to test “extremes and in-betweens”. The alternatives did not exhaustively cover all the potential combinations of access options, but were developed in an attempt to extract basic large-scale conclusions about network changes and needs. The basic elements of the alternatives are described below.

- **Alternative 1** included the closure of Waverly Road, grade separations on Four Corners Road, and widening on Gardner Road/Center Street. A new interchange at I-35/Homestead Lane was also included.
- **Alternative 2** included the closure of both Waverly Road and Four Corners Road, and widening on Gardner Road/Center Street. This alternative is considered a “worst case” local traffic alternative, because it closes all the existing at-grade crossings on the perimeter of the intermodal site. A new interchange at I-35/Homestead Lane was also included.
- **Alternative 3** included the closure of Four Corners Road, grade separations on Waverly Road, and no improvements to Gardner Road/Center Street. A new interchange at I-35/Waverly Road/199th Street was also included.
- **Alternative 4** included grade separations on both Waverly Road and Four Corners Road, and no widening on Gardner Road/Center Street. In some ways, this alternative can be considered a “best case” traffic alternative, because it would leave both major north-south roads (Waverly Road and Four Corners Road) through the site open. A new interchange at I-35/Waverly Road/199th Street was also included.
- **Alternative 5** included grade separations on both Waverly Road and 191st Street, and widening on Gardner Road/Center Street. No new interchange was included in the alternative.

Several other elements were common to many or all the alternatives:

- *Moonlight Drive Crossing:* Under all alternatives except Alternative 2, it was assumed that the Moonlight Drive at-grade crossing would be closed, and that a grade-separated crossing would be constructed at White Drive (roughly 2,000 feet east of Moonlight Drive). The City has long-term plans to construct the White Drive grade-separation, but has not decided whether the existing at-grade crossing at Moonlight Drive would ultimately be closed or would remain open.
- *I-35 Access:* It was anticipated that a new interchange would be needed on I-35 south of 191st Street, due to the intensity of proposed development, and as a way to separate industrial/truck traffic to the extent possible from the commercial areas planned for the vicinity of the 191st Street interchange. Two possible locations were examined for this interchange: I-35/Waverly/199th Street (Alternatives 3 and 4), and I-35/Homestead Lane (Alternatives 1 and 2). The pros and cons of each of these locations are discussed later in this report.

Alternative 5 was used to test the impacts of not building a new interchange, instead relying essentially solely on the I-35/Gardner Road interchange. (It is anticipated that traffic from the intermodal facility would also use this interchange in the interim period before a new I-35 interchange could be constructed.)

- *US-56 Access:* Direct site access to US-56 is not included in any alternative. The City has expressed the desire to minimize truck traffic on US-56 through Gardner.
- *183rd Street:* Due to the operational needs of the proposed intermodal site, with nearly 20 tracks potentially crossing 183rd Street between US-56 and Waverly Road, 183rd Street was assumed to be closed at both ends of the site under all alternatives.
- *Truck Routing:* For the alternatives that included an I-35/Homestead Lane interchange (Alternatives 1 and 2), it was assumed that intermodal trucks would have a fairly direct route to the new interchange from access on 191st Street. For Alternatives 3 and 4, which had a Waverly Road grade separation and an I-35/199th Street/Waverly Road interchange, intermodal truck access via Waverly Road was assumed. Alternative 5 assumed truck access via 191st Street, since no interchange was included south of 191st Street under this alternative.

In the modeling process, it was possible to control the routing of the intermodal trucks to a certain degree. However, traffic from the associated warehousing/distribution uses was distributed to the network using the algorithms of the model with little modification. These uses would generate both employee and truck traffic. Further discussions of truck routing are included in later sections of this report.

- *191st Street:* Only Alternative 5 includes a grade separation at 191st Street, tied to the elevated importance of the I-35/Gardner Road interchange under this alternative.
- *199th Street/Sunflower Road:* Only Alternative 2 includes improvements at this location. Because both Four Corners Road and Waverly Road would be closed, north-south improvements at this location are viewed as essential.

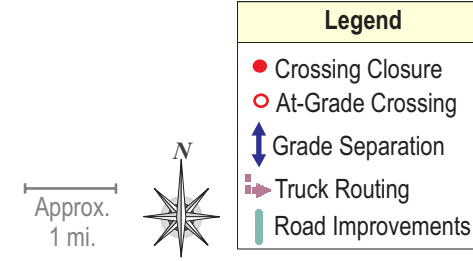
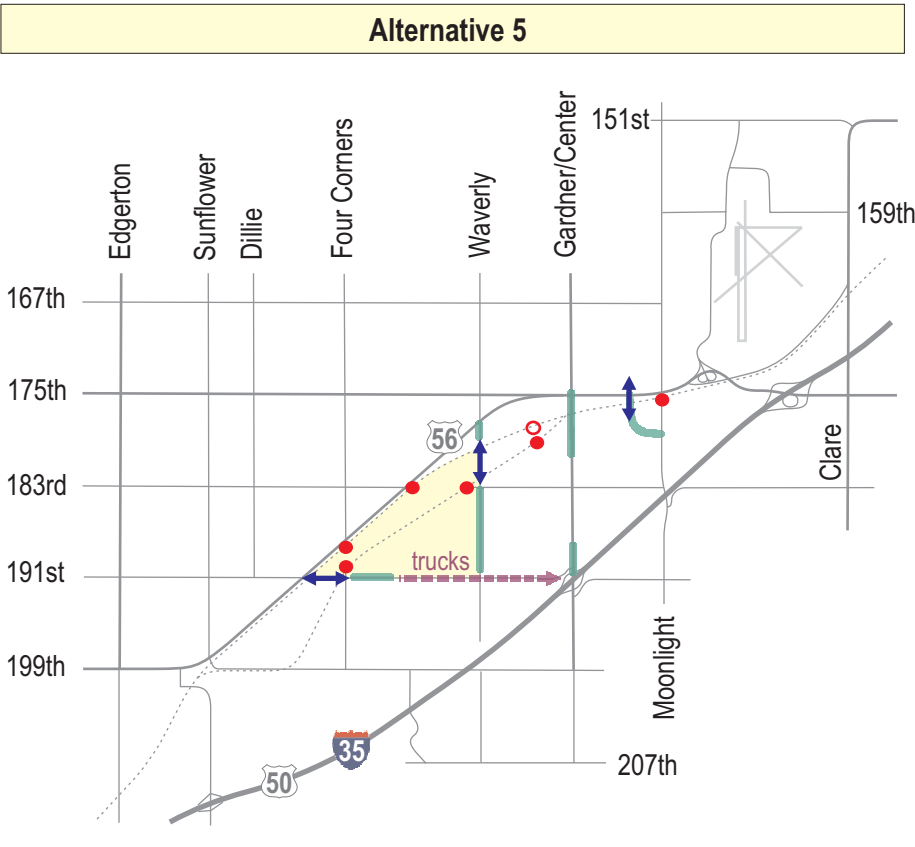
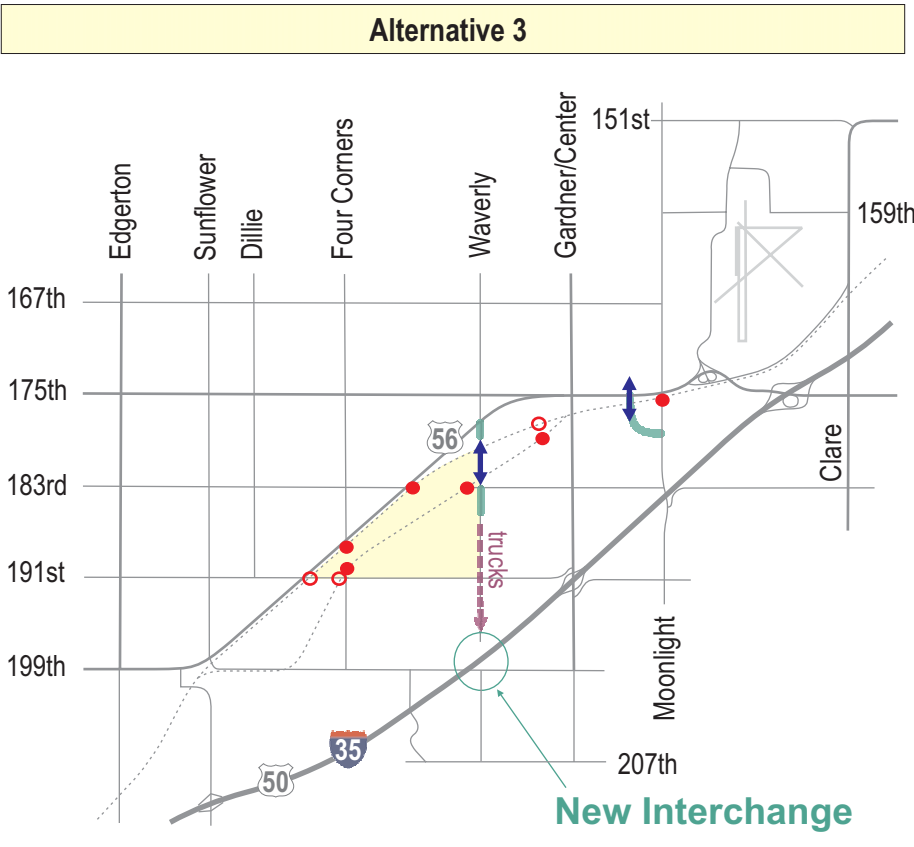
Land-Use/Access Assumptions

Under all scenarios analyzed, the land-use configuration of the site described in Section 5 was included in the model. In addition, the associated warehouse/distribution uses in adjacent areas, also described in Section 5, were included in the model. The remainder of the modeled land-use was identical to that included in the “No Build” scenario.

In addition to the network differences, the “Build” scenarios differed in terms of access. For the scenarios that had an I-35/Waverly Road/199th Street interchange (Alternative 3 and 4), the primary intermodal access was assumed to occur via Waverly Road north of 191st Street. For the two scenarios that included a Homestead Lane interchange (Alternatives 1 and 2), the primary intermodal access was assumed to occur via a connector between Homestead Lane and 191st Street at the south end of the project site. For Alternative 5, which had no new access, the primary intermodal access was assumed to occur via 191st Street, to most directly access the I-35/Gardner Road interchange.

Table 6-1: Modeled Traffic Infrastructure Alternatives

	Study Alternatives				
	1	2	3	4	5
Waverly Rd Crossing	Close	Close	Grade-separate	Grade-separate	Grade-separate
Four Corners Rd Crossing	Grade-separate	Close	Close	Grade-separate	Close
White Dr Crossing	Grade-separate	Grade-separate	Grade-separate	Grade-separate	Grade-separate
Moonlight Dr Crossing	Close	At-grade	Close	Close	Close
Sunflower/199th Intersection	Nothing	Grade-separate, align	Nothing	Nothing	Nothing
I-35 Access	Homestead Ln interchange	Homestead Ln interchange	199th St interchange	199th St interchange	191st/Gardner interchange
Truck Routing	191st to Homestead/I-35	191st to Homestead/I-35	Waverly to I-35	Waverly to I-35	191st to I-35
183rd St	Close	Close	Close	Close	Close
US-56 Access (from site)	None	None	None	None	None
Center St Improvements	4 lanes	4 lanes	2 lanes	2 lanes	4 lanes
191st St	Close	Close	Close	At-grade	Grade-separate
Poplar Street	Leave at-grade	Leave at-grade	Leave at-grade	Leave at-grade	Leave at-grade
Grand Street	Close	Close	Close	Close	Close



Initial Model Results

It is important to note that the model used for this study, while being the best available tool for the analytical task at hand, does have limitations that constrain the level to which the results can be used. The most significant of these are noted below:

- **Edge Effects and Regional Planning.** The study area is at both the southern and western edges of the model (see Figure 3-1). This means that many of the roadways and highways feeding the study area are “external stations”, locations at the edge of the model where future external traffic volumes are coded, rather than direct land-use assumptions. Forecasts must be developed for each of these external stations. In the study area, there are seven external stations on the western model boundary between 151st Street and US-56 (including US-56), and nine external stations on the southern model boundary between US-56 and US-69. As part of this traffic study, the external station volumes were adjusted to reflect higher growth rates, as described in Section 4 of this report.

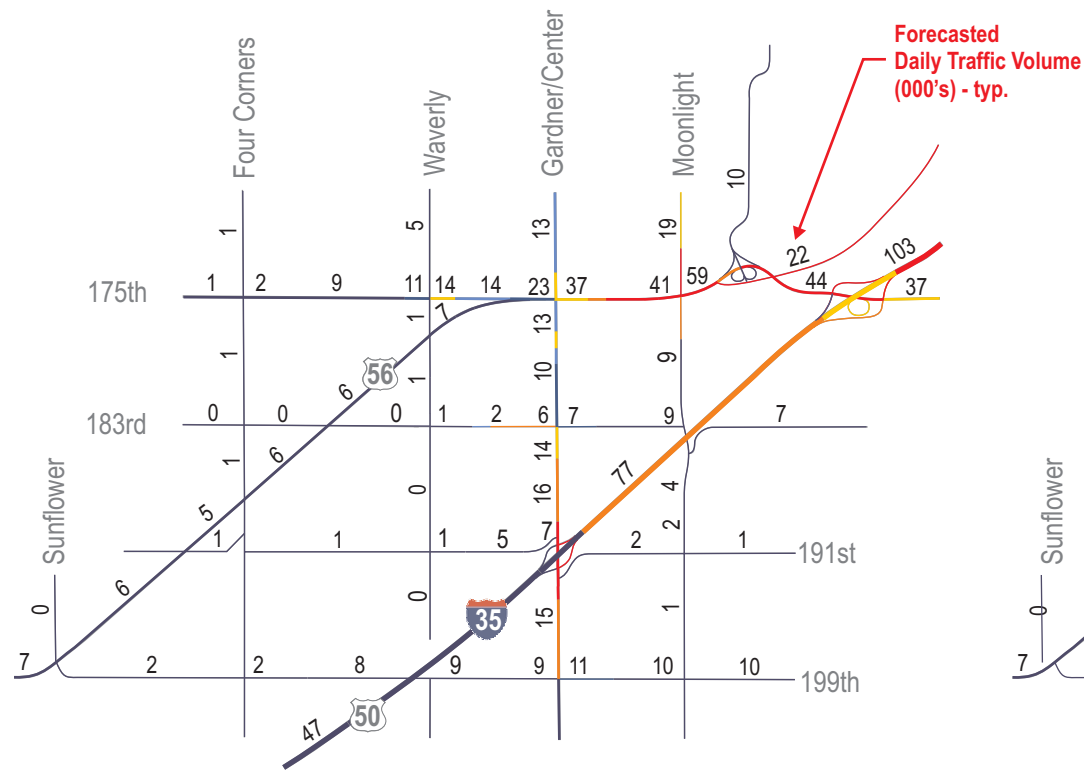
Moreover, the western model boundary is about 4 miles east of the Johnson/Douglas County boundary, and the southern model boundary is less than 2 miles north of the Johnson/Miami County boundary. The model boundaries in the study area also essentially match those of the Mid-America Regional Council (MARC) model boundary. The corridor bounded by K-10, 199th Street, the Johnson/Douglas County line, and Four Corners Road (or by the cities of Gardner, Edgerton, and DeSoto) has potential for future development, but because of its location at the edge of the Kansas City metropolitan area, the area has not been included in any regional transportation models. Therefore, the 2025 traffic forecasts for the study area do not include significant amounts of growth west of Four Corners Road.

- **Truck Modeling.** The model does not include an explicit truck component, although the trucks generated by future development are included in the vehicular volume projections. Therefore, items such as unique distribution for truck trips, and the effects of vehicle equivalency factors on capacity, were not represented by the model. Since the proposed intermodal facility would be truck-intensive, and truck trips would be an appreciable component of the associated warehouse and distribution facilities, the raw model results tend to somewhat understate the impacts in the study area. But at the planning level used for this study, the results were deemed representative. Adding a truck component to the model would be a significant undertaking and was well outside the scope of this study.
- **At-Grade Crossings.** The model does not account for the vehicular delay experienced while stopped for trains at at-grade railroad crossings. Adding such a component to the model would be a significant undertaking and would exceed the scope of this study. However, anecdotal descriptions of current crossing delays, as well as information supplied by BNSF related to future train traffic, were considered in the analysis of the model output and formulation of recommendations.
- **Preset Parameters.** Many of the parameters of the Olathe model are not accessible to the user due to the nature of the “shell” script controlling the modeling process. Therefore, items that one might normally consider accessing/adjusting for a study of this nature, such as the number of iterations to achieve convergence, coding for special traffic generators, etc., were not adjustable. The model has been calibrated and validated by others, and was essentially used intact except for changes noted in this document.

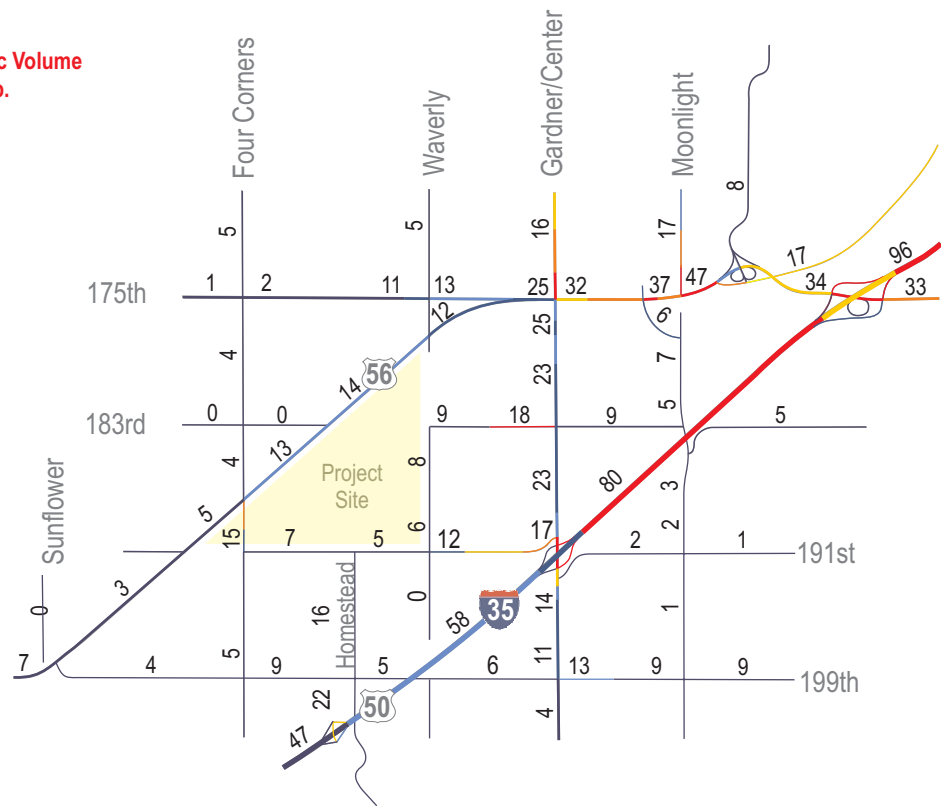
The limitations described above tend to suggest the use of the model as a high-level tool for the purposes of this study, comparing general volume trends between alternatives and considering daily volume-to-capacity (v/c) ratios as preliminary indicators of expected operations.

Figure 6-2 illustrates the 2025 modeled daily traffic volume forecasts and v/c ratios for the five initial alternatives.

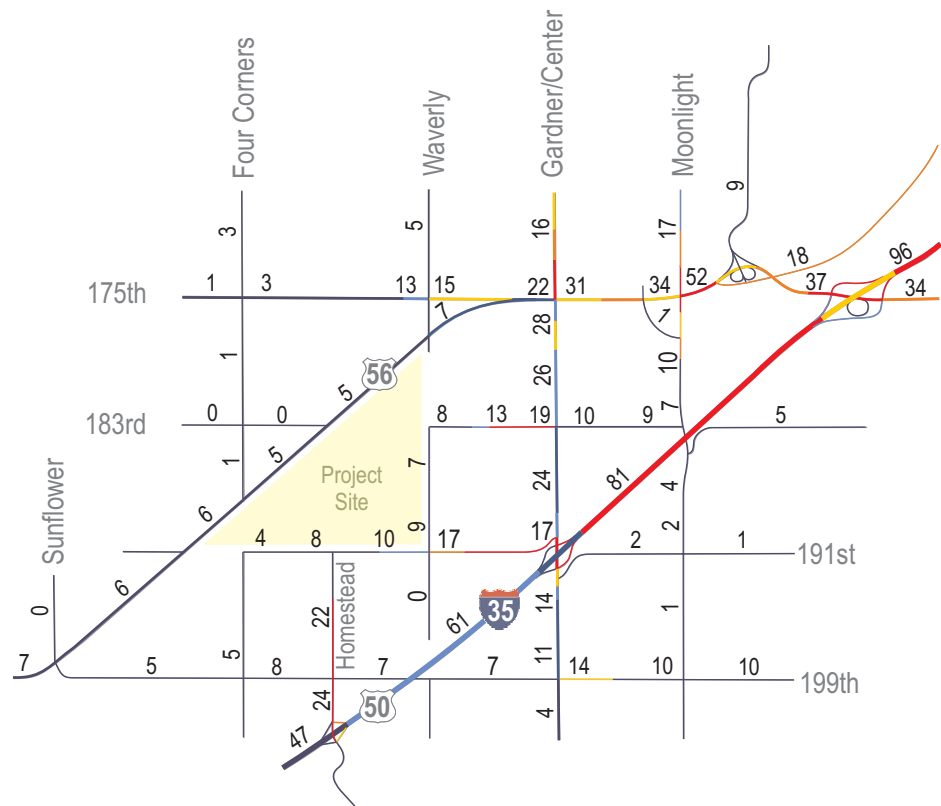
No Build



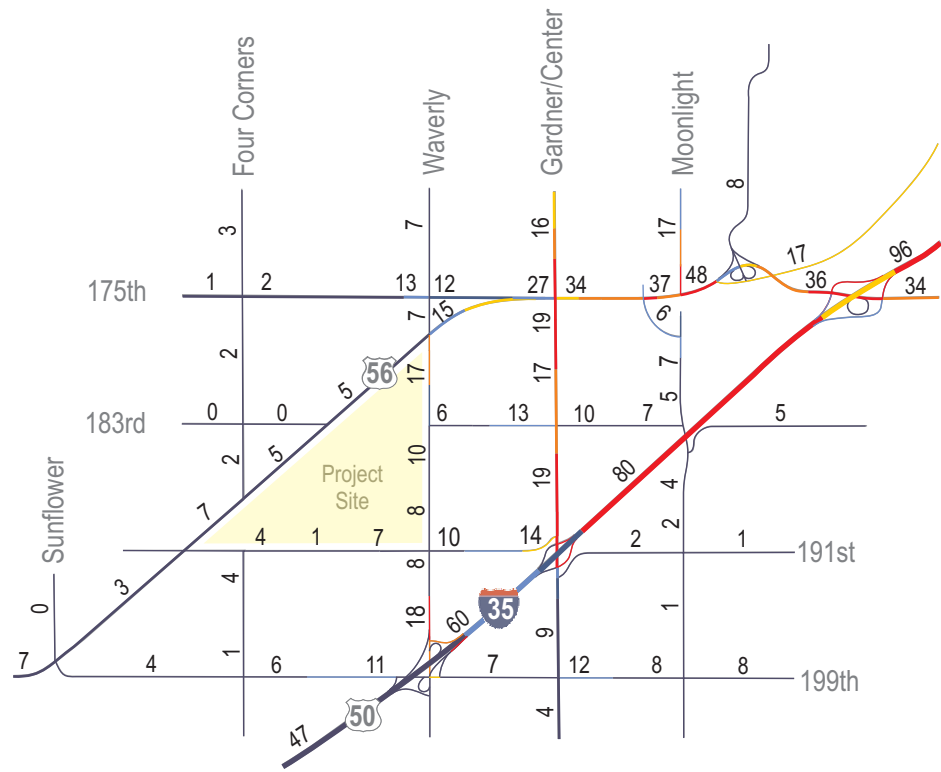
Alternative 1



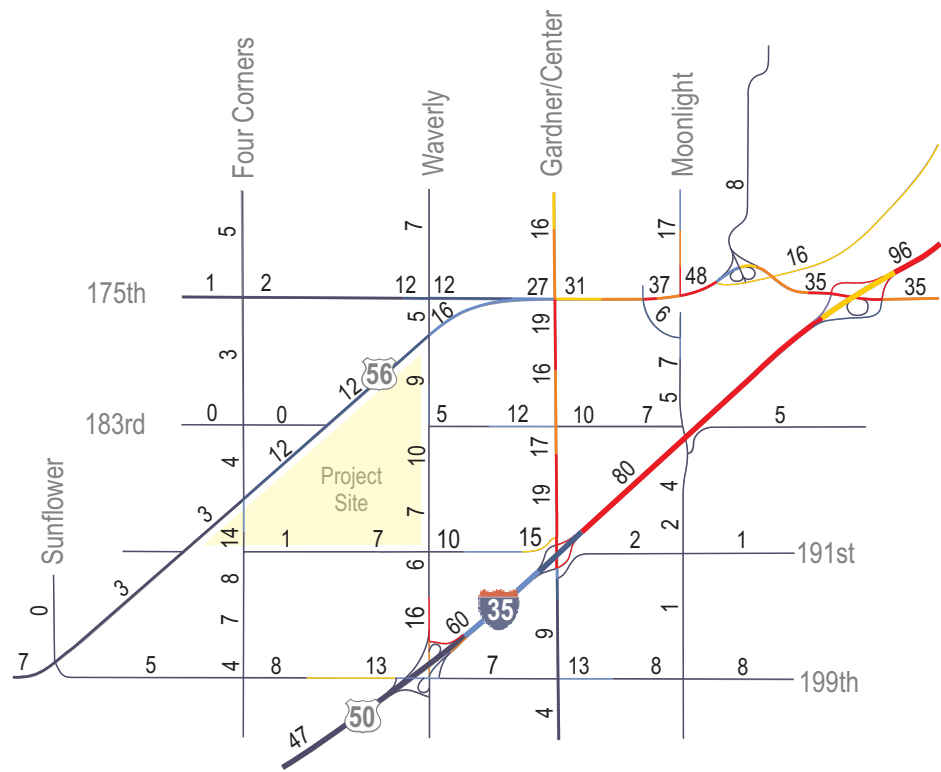
Alternative 2



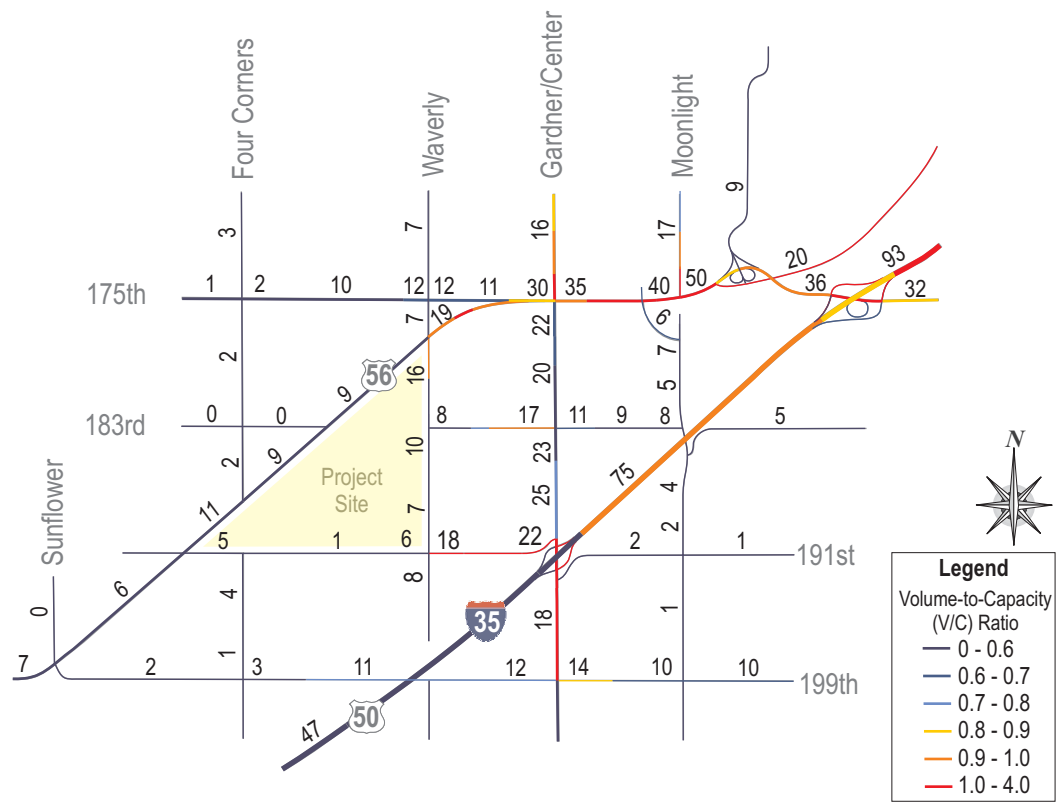
Alternative 3



Alternative 4

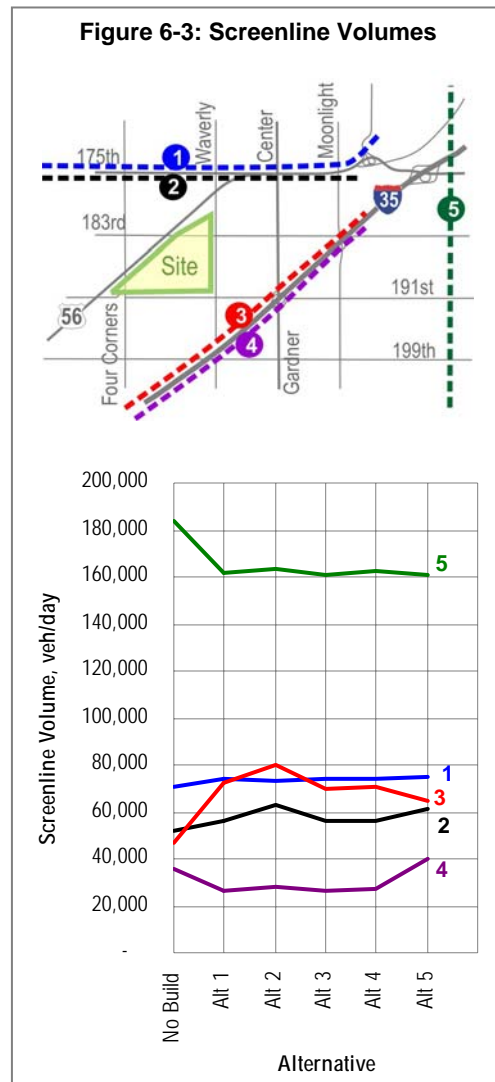


Alternative 5



To aid understanding of the model results at a large scale, Figure 6-3 illustrates summed traffic volumes across five different screenlines for each alternative. An analysis of these screenlines follows:

- **Screenline 1** is just north of 175th Street/US-56. In comparison with the 2025 “No Build” scenario, the “Build” scenarios all showed a slight increase across this screenline (from 71,000 vehicles per day to as much as 75,000 vehicles per day), and very little variation between scenarios (only about 1,500 vehicles per day between the highest and lowest cases).
- **Screenline 2** is just south of 175th Street/US-56, and showed increases in the “Build” scenarios similar to those across Screenline 1. Three of the alternatives (1, 3 and 4) showed increases on the order of 4,000 vehicles per day, while two of them (2 and 5) showed increases on the order of 10,000 vehicles per day. Alternative 2’s increases are attributable to heavier use of Center Street, and Alternative 5’s increases are attributable to heavier use of US-56.
- **Screenline 3** is just north and west of I-35, and was the only screenline across which “Build” volumes showed a significant “jump” in comparison to the “No Build” scenario. Screenline 3 indicates that, under the “Build” scenarios, a larger amount of traffic would use the I-35 interchanges in the study area.
- **Screenline 4** is just south and east of I-35. In comparison with the “No Build” scenario, volumes across this screenline would drop by 8,000 to 10,000 vehicles per day for all “Build” scenarios except Alternative 5. Alternative 5 would increase because a large amount of study area traffic would use 199th Street to access the I-35/Gardner Road interchange. But the remainder of the scenarios indicate that the study area would be “importing/exporting” less traffic to the west under the “Build” scenarios than under “No Build”.



- **Screenline 5**, a north-south line located at the east end of the study area, is perhaps the most telling of the five. Under the “Build” scenarios, traffic volumes across this screenline are projected to decrease fairly substantially (around 20,000 vehicles per day) in comparison to the “No Build” scenario. In essence, the model indicated that the Gardner area would “import and export” fewer trips to the rest of the Kansas City metropolitan area with the development of the Logistics Park than without it. This concept is discussed further below.

Viewed in combination, these five screenlines indicate a significant redistribution of trips within the study area in conjunction with the “Build” scenarios. Although many more trips would access I-35 within the study area under “Build” conditions, the net traffic leaving (and arriving in) the study area via I-35 was actually forecasted to decrease. Overall, more traffic would be contained within the study area. The model results seem to indicate that the development of the major employment generators would result in a more favorable jobs-housing balance within Gardner and the surrounding areas. The significant employment growth would complement, or help offset, the significant residential growth.

Conclusions

Upon comparison of model results for the five alternatives as well as the “No Build” scenario, and factoring in related information received from many parties throughout the study, the following conclusions were drawn:

- **A new interchange would be needed on I-35 south of 191st Street/Gardner Road** in conjunction with the proposed intermodal facility and associated development.

Under Alternative 5, the only alternative without a new interchange, the I-35/Gardner Road ramps alone were forecasted to carry about 49,000 vehicles per day, equating to 12,000 to 15,000 more daily vehicles than any of the other alternatives.

The model indicated that a new interchange at I-35/Homestead Lane (Alternatives 1 and 2) would carry ramp volumes of 21,000 to 24,000 vehicles per day, and a new interchange at I-35/Waverly Road/199th Street would carry 26,000 to 27,000 vehicles per day. Even with either of these interchanges in place, the I-35/Gardner Road interchange ramps were still forecasted to carry 32,000 to 37,000 vehicles per day. The new interchange is certainly justified based on the expected traffic, while the existing interchange, although greatly relieved, would continue to be an important element of the local and regional transportation system.

An interchange at I-35/Waverly/199th Street would provide more of a direct route to more of the study area, but would be complex due to the presence of two cross-streets, and would also be potentially operationally less desirable due to being located less than two miles from the I-35/Gardner Road interchange.

An interchange at I-35/Homestead Lane would provide more desirable separation from the existing I-35/Gardner Road interchange but would be less direct than a Waverly Road interchange and would therefore carry slightly less traffic.

- **Waverly Road would be an important north-south roadway for Gardner in the future**, if the intermodal facility and associated warehouse/distribution facilities were built.

The scenarios under which Waverly Road was closed at the railroad tracks (Alternatives 1 and 2) showed large amounts of traffic shifting to Center Street/Gardner Road, and to a lesser extent, US-56. An open Waverly Road (Alternatives 3, 4, and 5) would carry as much as 18,000 vehicles per day in the vicinity of a new I-35 interchange, and would carry from 7,000 to 17,000 vehicles per day between US-56 and 191st Street, depending on location and scenario. These volumes appear to point toward grade-separating Waverly Road across both the mainline and intermodal tracks.

If Waverly Road were to be grade-separated across the tracks, an important associated improvement would be realignment to correct the existing skew angle at the intersection of Waverly Road and US-56.

- **183rd Street west of the site is not anticipated to carry appreciable amounts of traffic.**

Under the 2025 “No Build” scenario, 183rd Street west of US-56 was forecasted to carry fewer than 1,000 vehicles per day. Although 183rd Street was assumed to be closed at the BNSF tracks under all of the “Build” scenarios, the fact that this portion of 183rd Street is near one of the model’s external stations means that volumes would not change appreciably under any scenario. The model does not forecast 183rd Street to be a major east-west route.

In addition, the requirements of the intermodal site would result in over 20 rail tracks (some mainline, some storage, some intermodal) crossing 183rd Street between US-56 and Waverly Road. Given the forecasted low-volume nature of 183rd Street in this vicinity, it is recommended that this segment of 183rd Street be closed.

It is noteworthy that 183rd Street *east* of Waverly Road is forecasted to draw a fair amount of traffic under the majority of the “Build” scenarios (anywhere from 12,000 to 19,000 vehicles per day just west of Gardner Road). This forecasted traffic is principally bound for Gardner Road, connecting to both US-56 to the north and I-35 to the south. Since I-35 to the north is the major attractor for traffic in the study area, one possible network enhancement that could be envisioned is a future I-35/183rd Street interchange. Such an interchange would present some planning challenges:

- It would intersect I-35 in the vicinity of Moonlight Road, resulting in a potentially complex interchange to service both a north-south road and east-west road.
- The interchange density along I-35 between US-56 and Gardner Road would increase; spacings between adjacent interchanges would be roughly 1.5 miles. Although this is certainly better than 1-mile spacing, it would be scrutinized by KDOT and FHWA and would require detailed operational analysis to ensure adequate operations could be maintained.



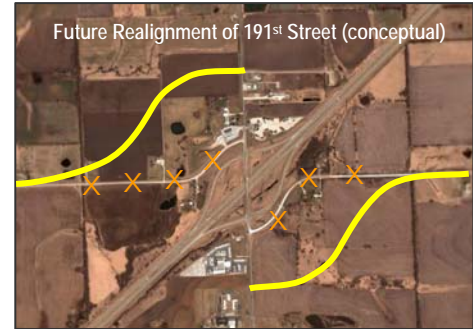
The primary benefit of such an interchange is that it could function as a reliever for US-56, serving as an alternate route for study area traffic traveling to and from the north on I-35. However, due to the potential complications described above, the interchange was not considered in detail in this study.

- **191st Street will be a critical link to the east, but not the west, given current land-use forecasts.**

In the 2025 “No-Build” scenario, 191st Street would carry very little traffic west of Waverly Road (on the order of 1,000 vehicles per day). Just west of Gardner Road, it would carry roughly 7,000 vehicles per day. With the development of the intermodal facility and associated warehouse/distribution sites, volumes on 191st Street west of Gardner Road would increase to anywhere from 14,000 vehicles per day to 22,000 vehicles per day. The I-35/Gardner Road interchange would be an important link to I-35 for many of the new sites, even if an interchange is built further south on I-35. 191st Street would likely need to be a four-lane facility from Waverly Road to Gardner Road, although a two-lane facility would likely suffice between US-56 and Waverly Road. Based on the model forecasts, closing 191st Street where the existing and future rail tracks cross (just east of US-56) would not have a negative impact on regional traffic circulation.

It is important to note that the current conceptual layout for the intermodal facility would not preclude a future grade-separation at 191st Street. The main tracks as well as the intermodal approach tracks would parallel US-56 from the south, and the intermodal tracks would turn east just north of 191st Street. This would allow a continuous, uninterrupted 191st street across Four Corners Road and as far west as the railroad tracks. While the model forecasts do not indicate the need for this connection (due to the low volumes on 191st Street west of US-56), it is a prudent planning and design consideration to allow for this future possibility.

It is also important to note that Gardner's long-range transportation planning includes the realignment of 191st Street as it approaches Gardner Road, swinging further to the north along the 188th Street alignment. This plan recognizes the importance of adequate spacing between interchange ramps and adjacent intersections. (Future plans include a similar realignment of 191st Street - to the south in this instance - on the east side of Gardner Road.) Given the amount of traffic projected to use the I-35/Gardner Road interchange under the "Build" scenarios modeled, 191st Street (the primary route from the site to the interchange) will need to be at least a four-lane facility.



- **199th Street will serve as an important regional east-west connector in the future.**

Under all 2025 scenarios analyzed, the model seemed to indicate a traffic draw on 199th Street between US-169 (several miles east of the study area) and the southeast portion of the study area. The model forecasted 8,000 to 10,000 vehicles per day on 199th Street just west of Moonlight Drive under all 2025 scenarios. Within the study area, forecasted volumes on 199th Street tended to increase east of Moonlight Drive approaching Gardner Road (up to 14,000 vehicles per day), and then decrease moving further west to Waverly Road, US-56, and beyond. For example, the segment west of Four Corners Road is projected to carry at most 4,000 to 5,000 vehicles per day, and only in the scenarios with a new interchange on I-35 south of 191st Street. This decrease is certainly (at least in part) attributable to the "edge effects" discussed previously. However, other factors point to western portion of 199th as an important connector.

Transportation planners in the Kansas City Metropolitan Area have long envisioned a continuous regional east-west connector spanning the southern portion of both the Kansas and Missouri portions of the Metro area. At one time dubbed the "21st Century Parkway", the concept has recently risen anew in the fairly distant east from the study area. Portions of the "North Cass Parkway" (Missouri Highway 58) in the city of Belton and Cass County are constructed or under design, and MARC currently has a study underway to examine the feasibility of extending this facility into Kansas, tying into US-69 and possibly eventually K-7/US-169 (within 5 to 10 miles of the study area). This facility being studied by MARC is now known as the "South Metro Connector". Ultimately, some envision that this connector could tie into a western loop road at the edge of Johnson County. It must be noted that the model may not fully account for the effects of such a connection, due to the lack of significant land-use growth assumed west of the study area.

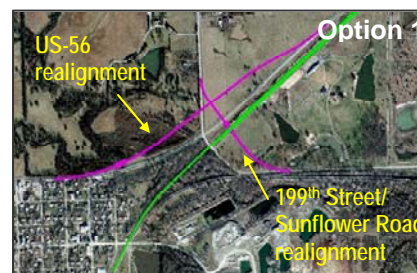
On a more local scale, 199th Street and Sunflower Road might play an important future role in access and connectivity for the City of Edgerton. Especially if a new interchange were provided on I-35 between Sunflower Road and Gardner Road, 199th Street would become an important route for Edgerton traffic traveling to and from the north. Furthermore, 199th Street becomes US-56 west of Sunflower Road, and provides a continuous east-west connection to regional facilities such as US-59 south of Lawrence (about 15 miles west of the study area) and US-75 south of Topeka (over 35 miles west of the study area).

As mentioned previously in this report, almost all of the trains stopping at the intermodal facility would travel to and from the southwest. This means that several trains a day would be traveling at slower speeds as they crossed 199th Street than they are today. Blockage times on 199th Street would increase as these slower trains crossed, correlating to an increase in delays experienced by vehicles waiting at the crossing. However, the relocation of the Main 2 tracks would eliminate a speed-

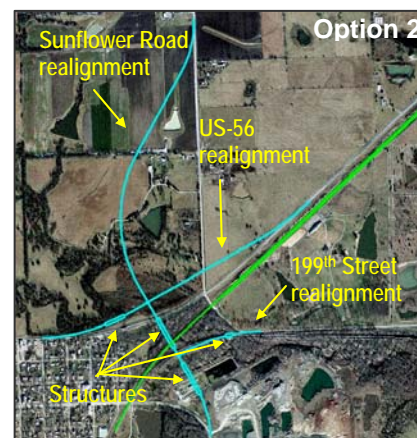
restricting curve, allowing eastbound “through” trains (not stopping at the intermodal facility) to travel faster than they do today. The consolidation of the tracks would result in more trains per day at a single location. To maintain the local and regional connectivity addressed in the previous paragraphs, a grade-separation at the 199th Street crossing seems a prudent measure.

Figure 6-3 illustrates two conceptual layouts for this potential grade-separation:

- Option 1 would preserve the essence of current operations by having 199th Street bend to the north to connect with Sunflower Road, spanning the tracks in the process. US-56 would have to be realigned locally to the north to allow 199th Street to meet it at grade at a sufficient distance from the overcrossing. US-56 would also need to cross the creek north of Edgerton (as it does now), requiring a new structure due to the new alignment.



- Option 2 would address a more regional concern by removing the existing discontinuity in Sunflower Road east of the city of Edgerton. Sunflower Road would possibly have to bridge an existing treatment facility and the BNSF tracks before intersecting with US-56. It would then need to swing gradually back to the east to rejoin its existing alignment just south of 191st Street. 199th Street would turn slightly south (roughly along the existing BNSF Main 2 alignment), and would need to bridge the creek before intersecting Sunflower Road, possibly between two bridges. US-56 would again need to be locally realigned to the north, with a possibly longer bridge over the creek than envisioned for Option 1.



Option 2 is obviously the far more expensive of the two, and its desirability hinges largely on questions of regional north-south connectivity. If the County is interested in using the existing I-35/Sunflower Road interchange as the linchpin of a major north-south connection between the cities of Edgerton and DeSoto (or I-35 and K-10), Option 2 is very desirable, and has the added benefit of reducing traffic volumes crossing another at-grade crossing – Nelson Street in Edgerton. If, however, the County plans to pursue a new I-35/Edgerton Road interchange as the southern end of an Edgerton-DeSoto connection, Option 1 would probably be an acceptable solution for 199th Street. Other options could also be examined, should this improvement be pursued.

- **Four Corners Road, based on current land-use forecasts, would serve more as a local connector than a regional one.**

Under the 2025 “No Build” scenario, Four Corners Road was not forecasted to carry large amounts of traffic within the study area. South of 175th Street, Four Corners Road would carry between 300 and 1,500 vehicles per day.

Under the 2025 “Build” scenarios in which the Four Corners Road crossing of the railroad tracks remained open (Alternatives 1 and 4), Four Corners Road was forecasted to carry up to 4,000 vehicles per day north of US-56. Between US-56 and 191st Street, it would carry up to 15,000 vehicles per day, mostly bound for US-56 to the northeast. South of 191st Street, it would carry up to

7,000 vehicles per day. The forecasted volumes indicate that the function of Four Corners would be more local than regional.

As with 191st Street, it is important to note that the current conceptual layout for the intermodal facility would not preclude a future grade-separation at Four Corners Road, although some realignment would be necessary. While the model forecasts do not necessarily indicate the need for the connection, it is once again a prudent planning and design consideration to allow for this future possibility.

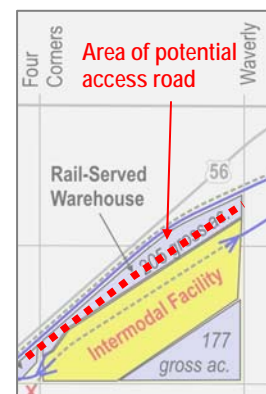
- **The status of US-56 as a key regional and local facility will continue to be integral to future planning by the City of Gardner.**

Under all scenarios analyzed, including “No Build”, the model forecasted traffic volumes on US-56 east of Center Street in a range of 30,000 to 40,000 vehicles per day, which begins to suggest a 6-lane section east of Center Street. East of Moonlight Drive, US-56 would carry 59,000 vehicles per day under “No Build” conditions, but less traffic – 47,000 to 52,000 vehicles per day – under the various Alternatives analyzed. Again, these volumes suggest a six-lane facility will be needed.

North of US-56, there are existing barriers to east-west travel through Gardner: Gardner Lake and the New Century Air Center. South of US-56, the proposed intermodal facility would present a new east-west barrier. These barriers would tend to continue to focus much of the City’s east-west traffic on US-56. Future transportation planning efforts in Gardner should examine ways to relieve US-56 – on the south side, by careful attention to land-use patterns and development layouts to funnel traffic to alternative routes to the extent possible, and on the north side by considering potential alternate access to I-35 between 151st Street and US-56. This last consideration far exceeds the scope of this study, but may be worth contemplating in long-range planning for the City.

- **Access to the rail-served warehouse properties between the intermodal facility and US-56 would need careful consideration and design.**

As illustrated earlier in this report, the conceptual layout for the proposed site currently indicates nearly 240 acres of direct-rail-served warehouse uses between the intermodal facility and the existing BNSF mainline tracks parallel to US-56. These facilities could generate over 12,000 trips per day. The current proposal is to serve these facilities with a roadway that would intersect Waverly Road between the proposed intermodal tracks and the existing BNSF Main 1 track. This roadway would be well over a mile long. If no grade separations are to be provided across the tracks at Four Corners Road or 191st Street, there would **at a minimum** need to be an emergency access (either to Four Corners Road, 191st Street, or US-56) provided at the southwest corner of the site to allow alternative access should the need arise.



- **A White Drive grade-separation does not appear to be justified unless Moonlight Drive is closed.**

Although fairly removed from the project site, the existing at-grade Moonlight Drive railroad crossing (just south of US-56) is certainly affected by train volumes on the BNSF mainline tracks. The fairly high volume of trains at this location, coupled with a fairly major signalized intersection (US-56) less than 100 feet away, contribute to lengthy delays at this crossing – anecdotal evidence of which was supplied by the City of Gardner.

As mentioned previously in this report, BNSF indicates that all but a very small number of trains stopping at the intermodal facility will be traveling to and from the southwest, and therefore train speeds crossing Moonlight Drive are not expected to decrease in the future. However, mainline train volumes *are* expected to continue to increase in the future, and therefore more delay will be experienced by motorists throughout the day at this crossing. Grade-separation at this location is an essentially infeasible option, given the separation distance and existing development

As mentioned previously in this report, the City of Gardner has long-term plans to construct a new grade separation at White Drive, approximately 2,000 feet east of Moonlight Drive. The City has not yet decided whether to close Moonlight Drive in conjunction with the White Drive crossing.



Alternative 2 was the only model scenario that kept Moonlight Drive open across the BNSF tracks. Under this scenario, White Drive was forecasted to carry 1,000 vehicles per day. Under the remaining scenarios, which included the closure of Moonlight Drive, the White Drive was forecasted to carry 6,000 vehicles per day. It is important to note, as stated earlier in this report, that the model does not account for extra vehicular delays associated with trains crossing the road. Also, the long-term City plans for White Drive, although not included in the Olathe model, include development as a lengthier and more continuous route north of US-56. This would potentially draw additional traffic to the White Drive grade-separation.

The White Drive crossing will be an important tool to increase safety across the BNSF tracks in eastern Gardner. To fully realize the benefits of this option, and to increase safety while reducing frustrating delays, it is recommended that the Moonlight Road crossing be closed. The intersection of US-56 and Moonlight Road could remain as a three-legged configuration, thereby increasing its vehicle processing capacity. White Drive would need to be carefully studied, developed, and designed to serve local traffic circulation needs.

- **The Center Street overpass of the BNSF tracks will likely need to be widened to four lanes.**

The traffic model forecasted volumes of 19,000 to 28,000 vehicles per day on Center Street crossing the BNSF tracks under the “Build” scenarios. These volumes certainly suggest that a four-lane facility would be needed.

7. Recommendations and Next Steps

Project-Related Improvements

The traffic model used for this study does not include a large amount of land-use growth west of US-56. In general, the model supports the closing some of the existing at-grade crossings and grade-separating the others. Based on the conclusions drawn in Section 6, the following is a summary of recommendations related to the proposed BNSF Logistics Park:

- A new interchange should be pursued on I-35 southwest of Gardner Road. Homestead Lane appears to be the most promising location, but Waverly Road/199th Street should also be considered as well. Further study of the interchange is needed, but it would need to be a high-capacity facility with considerations for heavy truck volumes.
- The I-35/Gardner Road interchange will need substantial capacity improvements, both in the near-term as the intermodal facility comes on-line and no new interchange is developed, and in the long-term as development south of Gardner intensifies. Heavy traffic volumes, and truck considerations, will be important factors in improvement to this interchange.
- Waverly Road should be grade-separated at the two different BNSF track crossings between US-56 and 183rd Street. Waverly Road should be improved to four lanes south of US-56, and the skewed intersection at Waverly Road/US-56 should be realigned.
- 199th Street should be grade-separated at the BNSF crossings near US-56. There are options for how this grade-separation could be designed, hinging on more regional questions of north-south connectivity.
- The Center Street crossing of the BNSF tracks will need to be widened to four lanes, along with the approaching roadway from the south.
- 183rd Street should be closed between US-56 and Waverly Road. The amount of tracks that would cross 183rd Street in conjunction with the intermodal facility (over 20), coupled with the relatively low vehicular traffic volume forecasts, support this closure.
- The 191st Street crossing of the BNSF tracks can be closed. Although 2025 traffic forecasts indicate that a grade-separation would not be justified, the site plan should be (and has been) designed not to preclude such a possibility. Near I-35, 191st Street will need to be improved to a four-lane facility.
- The Four Corners Road crossing of the BNSF tracks can be closed. As with 191st Street - although 2025 traffic forecasts indicate that a grade-separation would not be justified, the site plan should be (and has been) designed not to preclude such a possibility.

Preliminarily, the cost for these roadway infrastructure improvements is estimated at \$66,500,000. Appendix C contains more details on the various cost estimates that were developed during this study.

Improvements Not Directly Related to the Project

Several improvements were found to be needed whether or not the Logistics Park and associated warehouse/distribution centers were developed:

- I-35 mainline will need to be improved to six lanes, potentially as far south as Gardner Road.
- US-56 will need to be improved to six lanes from Center Street to I-35 (and beyond).
- Center Street will need to be improved to a continuous four lanes from 183rd Street to I-35.

- Old US-56 (outside the study area) will need to be improved to four lanes.
- A grade-separated White Drive crossing of the BNSF tracks would serve to relieve the existing Moonlight Road at-grade crossing. With proper development of White Drive to serve local circulation, it is recommended that the Moonlight Road crossing be closed.

Potential Improvements not to be Precluded

Two improvements were not found to be justified by the traffic forecasts, but it is recommended that the intermodal facility be designed to not preclude them:

- A grade-separation at 191st Street over the BNSF tracks.
- A grade-separation at Four Corners Road over the BNSF tracks.

Next Steps

BNSF expects the intermodal facility to be operational by the Fall of 2008. By that point, the closures of at-grade crossings at 183rd Street, Four Corners Road, and 191st Street will need to be implemented due to the number of new, slow-speed tracks crossing each of these facilities. The remaining at-grade crossings can remain open, at-grade, and signal-controlled until volumes warrant grade separations. The process for requesting, designing, and constructing a new interchange on I-35 should begin immediately, but it would be several years before such an interchange is operational. (The process would be initiated with a Break-in-Access study submitted to KDOT and FHWA.) In the interim, significant capacity improvements will be needed at the I-35/Gardner Road interchange. The details of these improvements will need to be developed through further focused study. 191st Street will also need to be improved between the intermodal site and Gardner Road, including the City's proposed realignment.

Perhaps most importantly, the study has highlighted the need for more focused regional transportation planning in the area between the Cities of Gardner, Edgerton, and DeSoto – the western boundary of southern Johnson County. The future development status of this area will have a significant impact on transportation needs throughout the region, including the study area covered by the BNSF Logistics Park study. It is recommended that transportation planning tools for this region be enhanced, whether through the building of a new model or an extension of existing models.

Appendix A:

Use of the Olathe Travel Demand Model

Appendix A: Use of the Olathe Travel Demand Model

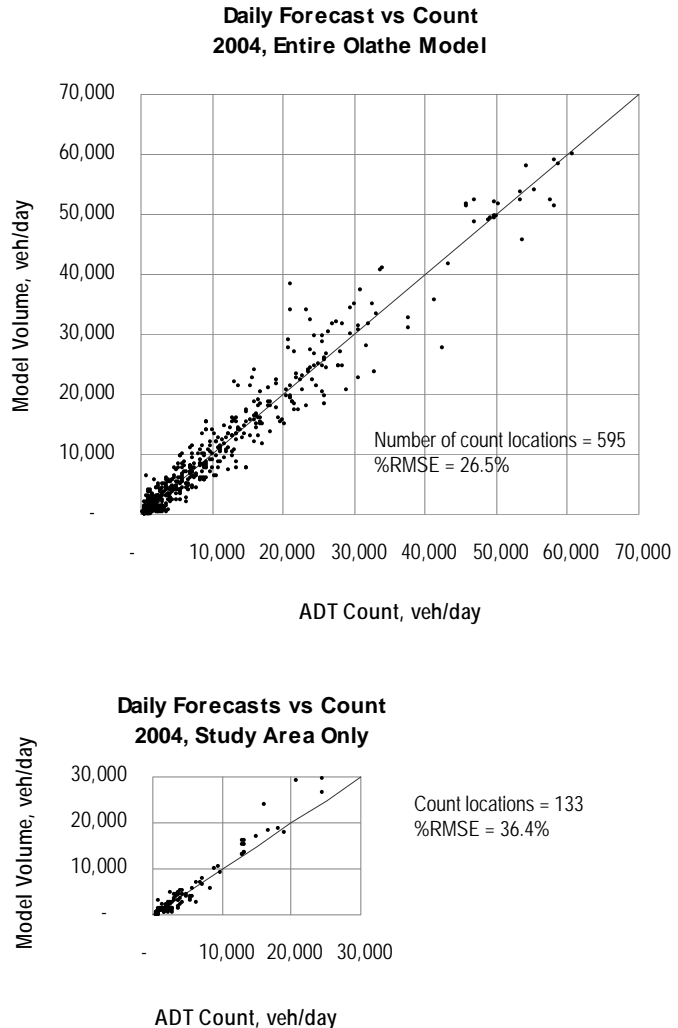
Key Olathe model parameters are discussed in Section 3 of the report. The focus of this Appendix is on existing conditions “validation”, and on development of 2025 land-use forecasts.

Study Area “Validation”

The entire Olathe model was previously validated and calibrated for 2004 as part of the model development process undertaken by others. As part of the study for the intermodal facility, validation statistics were also computed solely for the study area, as a comparison. Figure A-1 illustrates the results of the validation process. The graphs show the model’s “forecasted” existing daily volume vs. the actual counted existing volume. The upper graph indicates the fit for all available count locations within the entire model network, and the lower graph indicates the fit for the intermodal study area, which contains roughly 22 percent of the total count locations.

One standard measure of how well a model is predicting is root-mean-squared error (RMSE). RMSE values below 30 percent are typically considered acceptable for Citywide models. As a whole, the existing conditions Olathe model had an RMSE of 26.5 percent. When the Gardner study area is broken out, it fares worse at 36.4 percent. It should be noted that the number of locations for the Gardner “subarea” is much less than the entire model, so more variability could be expected to result. These results are presented for informational purposes only, and as a gauge of the model’s effectiveness. Re-calibrating the model in the Gardner study area is beyond the scope of this study.

Figure A-1: Olathe Model Validation Results

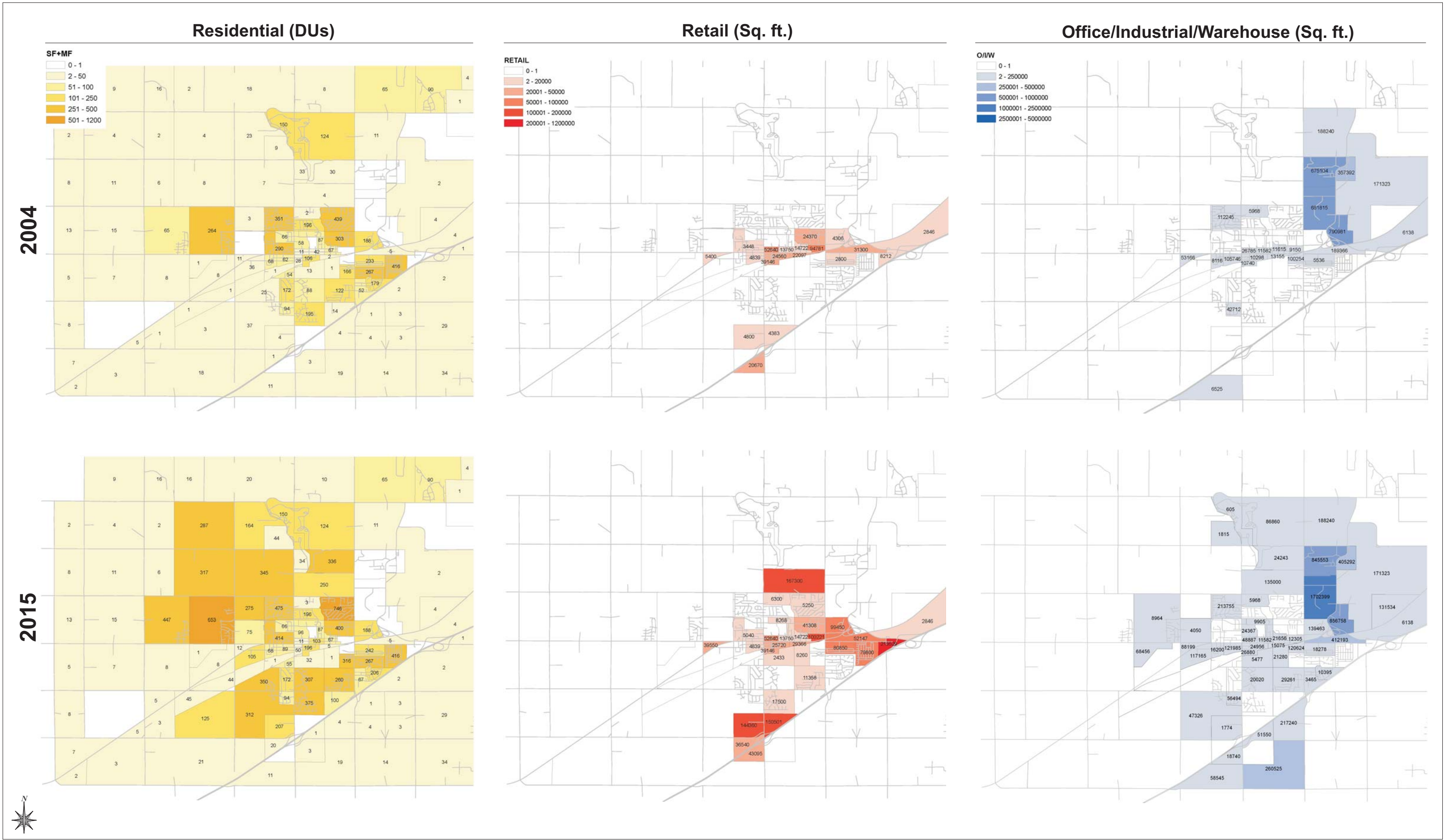


2025 Land Use

To develop 2025 land-use assumptions for the study, an initial linear interpolation was made between the 2015 and 2050 land-use assumptions included in the model. Figure A-2 illustrates both the 2004 and 2015 land-use assumptions contained in the Olathe model. The figure shows land use totals for Traffic Analysis Zones (TAZs) for three different aggregations of land-use categories: residential, retail and office/industrial/warehouse.

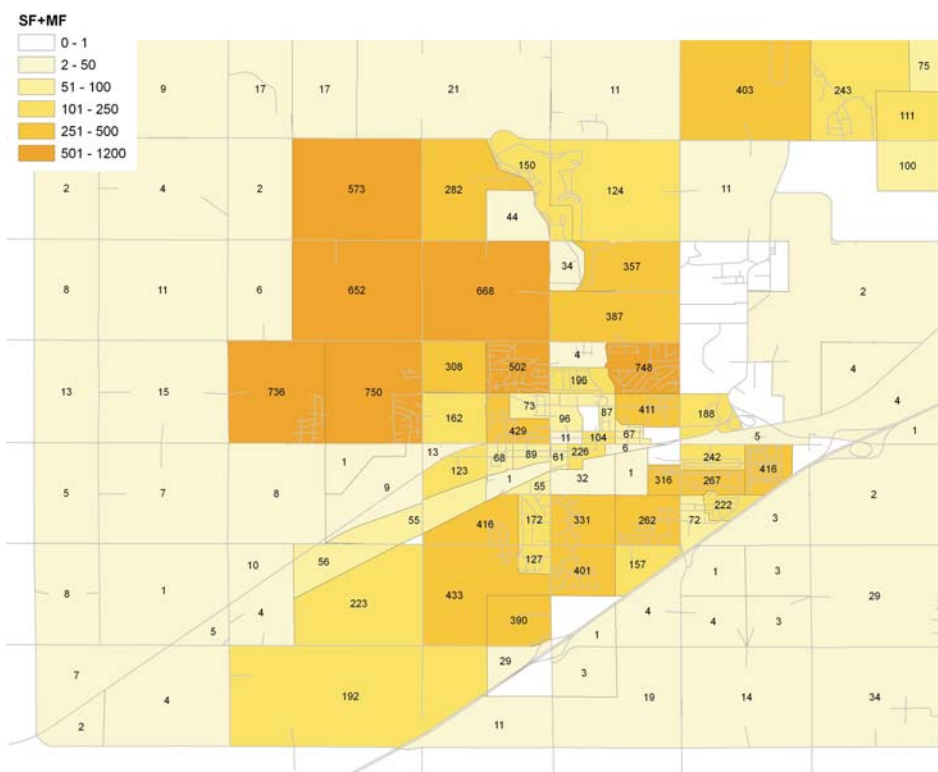
The upper half of Figure A-3 illustrates the results of the interpolation to 2025. Once the interpolation was completed, the City of Gardner adjusted the land-use totals based on expectations for development within the City by 2025, and also shifted some of the industrial/warehouse uses from the east side of I-35 to the west side. The lower half of Figure A-3 illustrates the results of this modification. These land-use assumptions constituted the 2025 “No Build” scenario for this study.

To create the “Build” scenarios, the land-use trip generation assumptions described in Appendix B were incorporated into the relevant TAZs of the model.

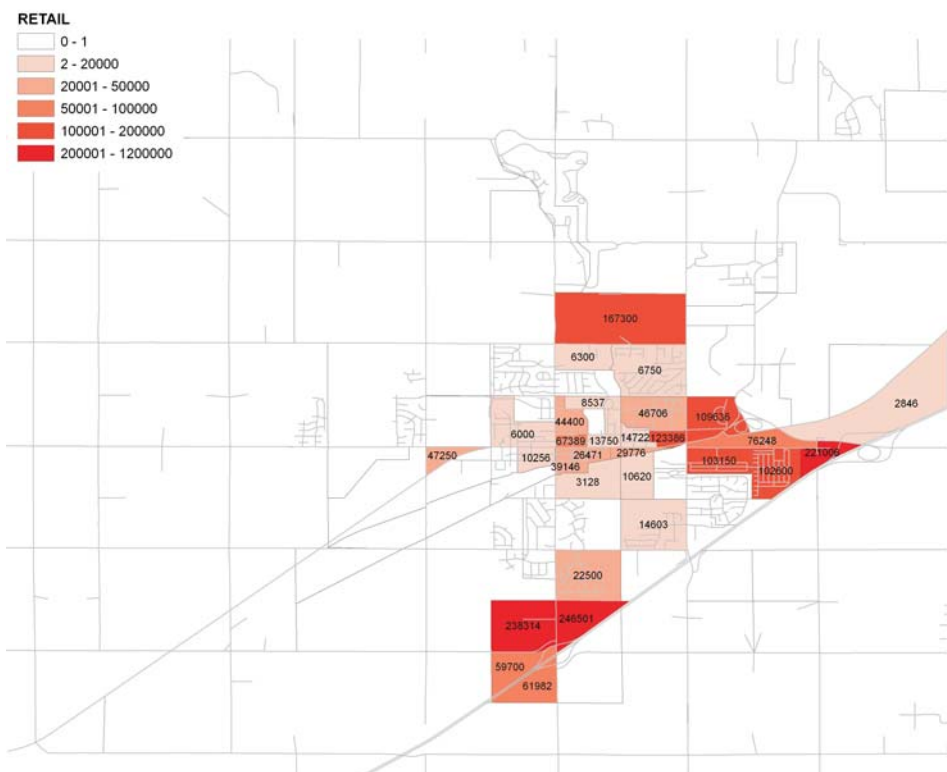


2025 - Interpolated from original model

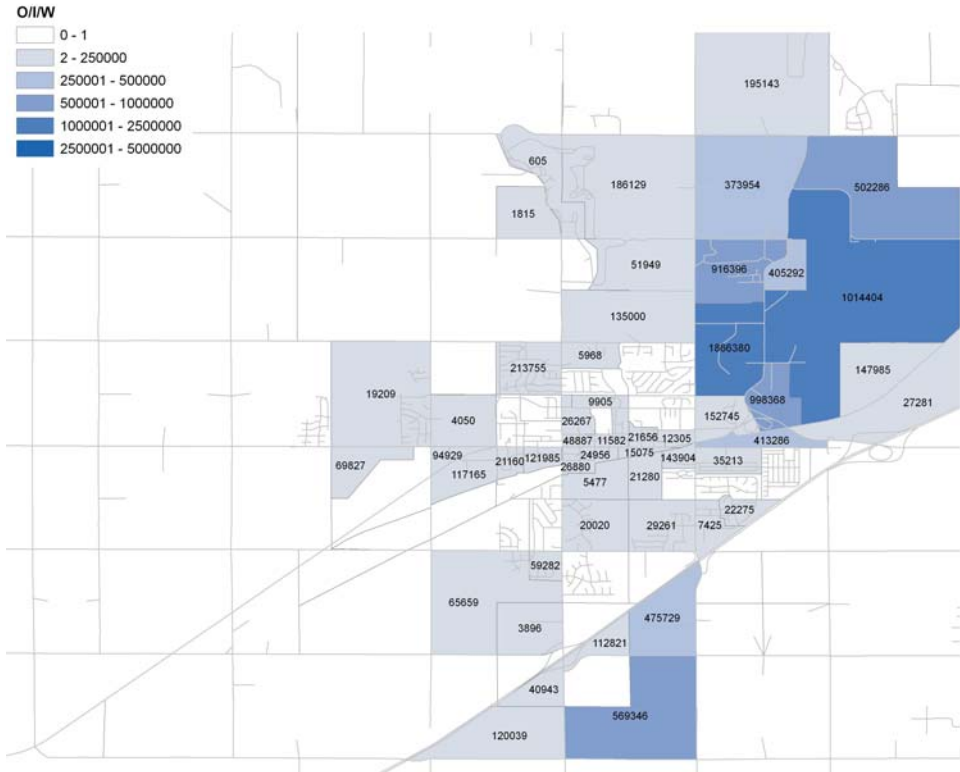
Residential (DUs)



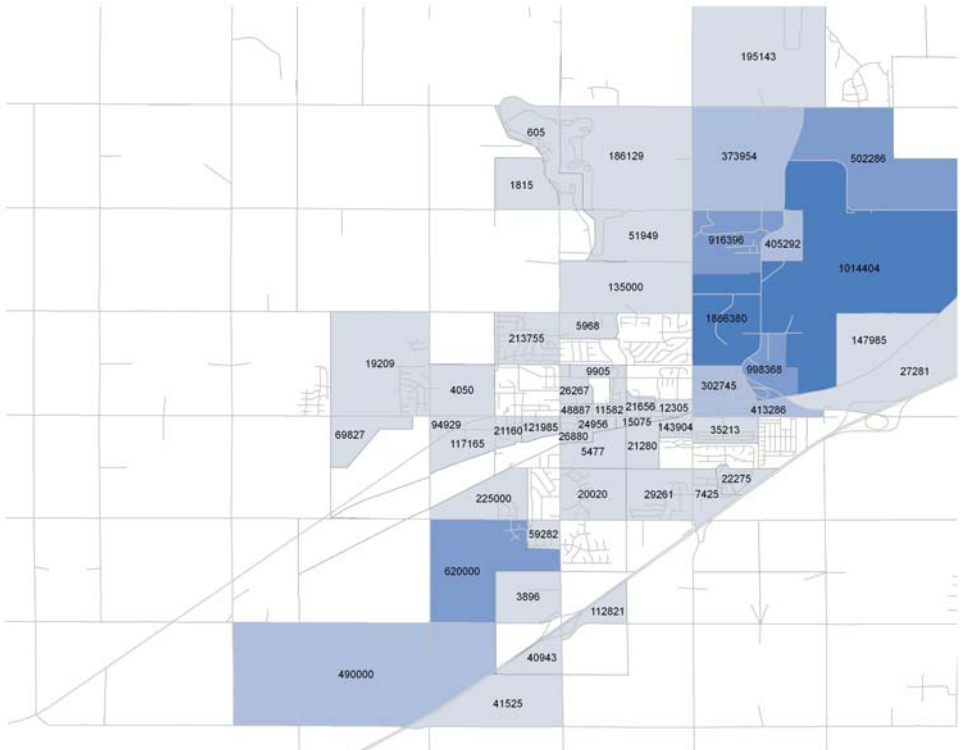
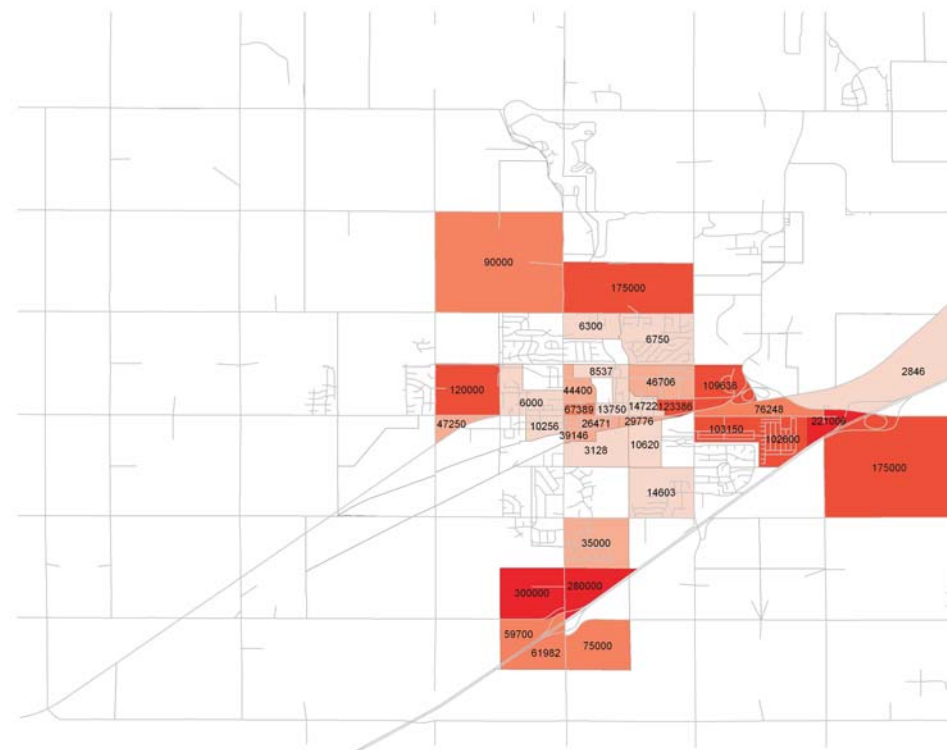
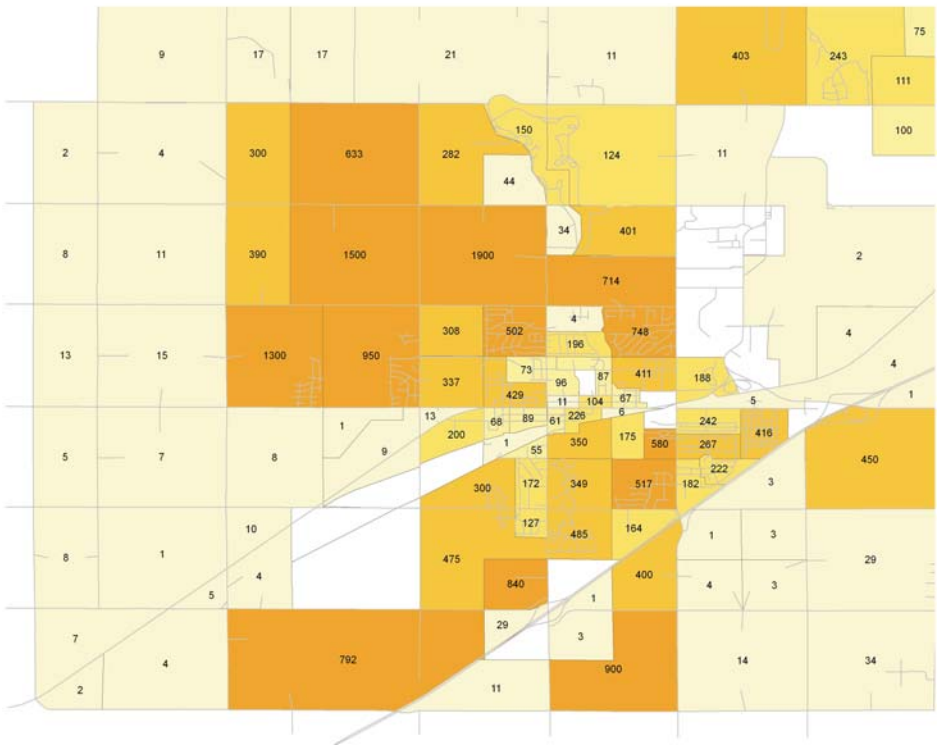
Retail (Sq. ft.)



Office/Industrial/Warehouse (Sq. ft.)



2025 - Gardner revisions



SF +4,059 du MF +3,746 du

Retail +575,385 s.f.

Office -398,381 s.f. Industrial -868 s.f. Warehouse +985,000 s.f.

Figure A-3: 2025 Olathe Model Land Use vs. City of Gardner Revisions

Appendix B:

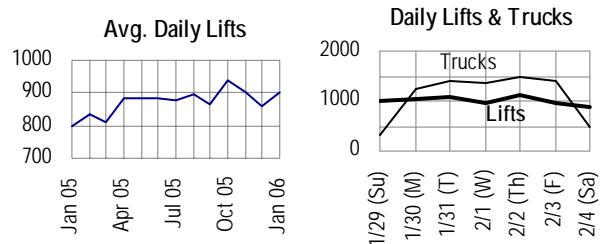
Development of Trip Generation Assumptions

Appendix B: Development of Trip Generation Assumptions

Intermodal Facility

BNSF provided information regarding truck flows at the existing intermodal facility at Argentine Yard in Kansas City, Kansas. This information was used to refine assumptions for truck trip generation from the intermodal facility (not related to warehousing or distribution centers).

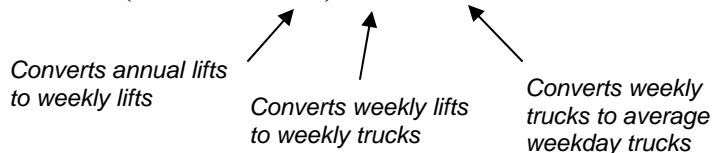
The first graph at right illustrates the monthly trends in lifts per day at the Argentine Yard. In 2005, the facility reported 317,000 lifts. This equates to an average of 869 lifts per day. Although it is clear that some months had more lifts than others (October is a notable example), much of the year showed fairly consistent lifts-per-day averages.



The second graph illustrates Argentine's daily checkpoint truck traffic (inbound and outbound) for a recent week (January 29 - February 4, 2006), compared to lifts ("loads" from truck to train and "grounds" from train to truck) for the same week. Lifts were fairly uniform throughout the week and weekend, but actual truck volumes were much lighter on the weekend. The average weekday experienced 18 percent of the 7-day week's truck volume. Also, for the 7-day week, there were 9 percent more trucks than lifts, mainly because some trucks "bobtail" (arrive empty and leave full, or vice versa).

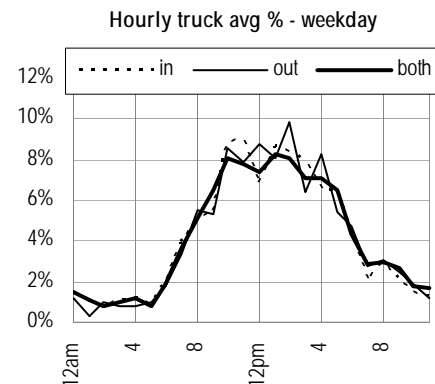
Based on this information, it appears reasonable to derive typical weekday truck traffic volumes from annual lift data (or projections) by the following calculation:

$$\text{Weekday truck volume} = (\text{annual lifts} / 52) \times 1.09 \times 0.18 = \text{annual lifts} \times 0.003773$$



For the 1,000,000-lift scenario envisioned for the Gardner site, this would translate to 3,773 trucks per day on an average weekday.

The graph at right shows the recorded percent of daily truck traffic for each hour of the day at Argentine. The facility's peak occurred outside of typical traffic peak hours. Approximately 7 percent of the daily truck volume occurred during the typical traffic p.m. peak hour (56 percent inbound, 44 percent outbound). It should also be noted that during the p.m. peak hour, 71 percent of the trucks were full, 12 percent were empty and 16 percent had bare chassis.



Associated Warehouse/Distribution Facilities

The economic study being conducted for this project has forecasted that the intermodal facility would result in 1,000 acres of warehouse facilities, broken out as follows:

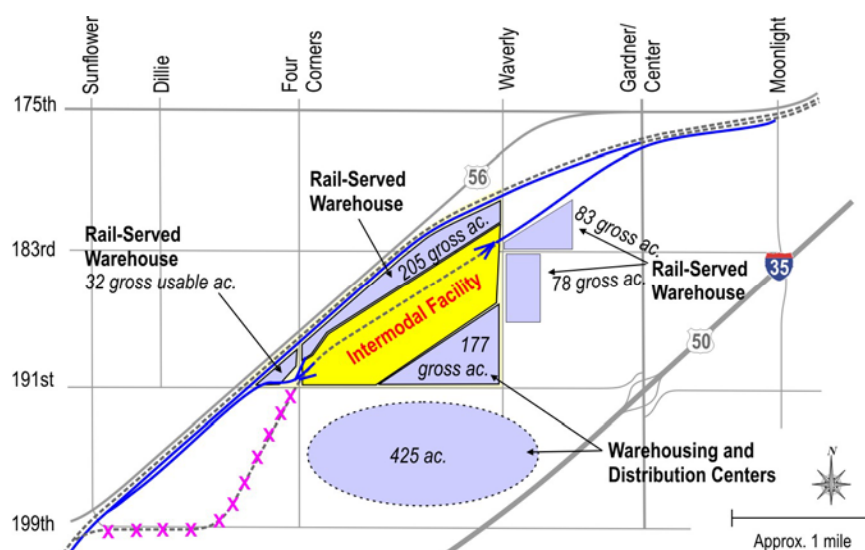
	Direct Rail-served	Intermodal-served non-rail	Total Intermodal-served
Total size (acres)	398	602	1,000
Number of sites	14	15	29
Individual site size (acres)	30	40	--
Individual building footprint (s.f.)	200,000 – 350,000	500,000	--
Total buildings (s.f.)	4,450,000	7,500,000	11,950,000
Absorption	12 years	12 years	1,000,000 s.f. per year
Employment ratio	6 workers/10,000 s.f.	6 workers/10,000 s.f.	--
Total employment	2,670	4,500	7,170

As can be gleaned from the table, by the transportation model's horizon year of 2025, it is expected that nearly 12 million square feet of intermodal-served warehouse facilities would have developed.

Of the 1000 acres, 398 were assumed to be rail-served warehouse development and 602 acres were assumed to be non-rail-served warehouse/distribution development in the 2025 traffic model. Figure B-1 illustrates the warehouse/distribution uses. The individual sites are broken out as follows:

- 205 acres, north of intermodal: six 350,000-square-foot rail-served warehouse sites and one smaller 200,000-square foot rail-served warehouse site.
- 32 acres, southwest corner of site: one rail-served warehouse sites at 350,000 square feet.
- 83 acres, west of site: three rail-served warehouse sites at 300,000 square feet each.
- 78 acres, west of site: three rail-served warehouse sites at 300,000 square feet each.
- 177 acres, southeast corner of site: four non-rail-served warehouse sites at 500,000 square feet each.
- 425 acres, south of 191st: eleven non-rail-served warehouse sites at 500,000 square feet each.

Figure B-1: Associated Warehouse Distribution Areas



Site Trip Generation

Based on the assumptions, trip generation assumptions were developed for the project site and associated warehouse uses. For the warehouse uses, ITE's *Trip Generation* (7th Edition) was used based on square footage estimates. Table B-1 summarizes the trip generation assumptions.

Table B-1:
BNSF Gardner Intermodal Facility Trip Generation Assumptions
3/15/06

	size	unit	count	Daily		P.M. Peak Hour					TAZ
				rate	trips	rate	in: out	trips			
								in	out	total	
On-Site Trip Generation											
Opening Year (2009)											
Intermodal Trucks	0.483	million annual lifts	1	3773	1,822	264.11	56: 44	72	56	128	745
Intermodal Employees	143	emp	1	2.00	286	0.000	50: 50	0	0	0	577
Rail-Served Warehouse	350	ksf	1	4.68	1,638	0.501	21: 79	37	139	176	570
Non-Rail-Served Warehouse/Distr (ITE 150)	500	ksf	1	4.38	2,190	0.465	21: 79	49	184	233	571
Total					5,936			158	378	536	
2025											
Intermodal Trucks	1.061	million annual lifts	1	3773	4,003	264.11	56: 44	157	123	280	745
Intermodal Employees	288	emp	1	2.00	576	0.000	50: 50	0	0	0	577
Rail-Served Warehouse	350	ksf	6	4.68	9,828	3.009	21: 79	221	832	1,053	570
Smaller Rail-Served Warehouse	200	ksf	1	5.43	1,086	0.564	21: 79	24	89	113	570
Rail-Served Warehouse	350	ksf	1	4.68	1,638	0.501	21: 79	37	139	176	570
Non-Rail-Served Warehouse/Distr (ITE 150)	500	ksf	4	4.38	8,760	1.861	21: 79	195	736	931	571
Total					25,891			634	1,918	2,552	
Off-site Associated Uses											
Opening Year (2009)											
no additional off-site ancillary warehouse											
2025											
Rail-Served Warehouse	350	ksf	3	4.68	4,914	1.504	21: 79	111	416	527	583
Rail-Served Warehouse	350	ksf	3	4.68	4,914	1.504	21: 79	111	416	527	584
Non-Rail-Served Warehouse/Distr (ITE 150)	500	ksf	11	4.38	24,090	5.118	21: 79	537	2,022	2,559	746
Total					33,918			759	2,853	3,612	

Assumptions for each category:

Intermodal Daily Trucks - Annual lifts are converted to daily and peak-hour truck trips through a series of conversion factors developed based on existing operations at the BNSF Argentine intermodal facility in Kansas City, Kansas.

Intermodal Employees - On a daily basis, each employee is assumed to make two site-related trips: one entering and one leaving. For the purposes of this study, it is assumed that trip reductions related to carpooling and absences offset trip increases related to errands and other off-site trips. Based on expected shift-change times provided by BNSF, **no employee trips (or a negligible amount) are expected during the p.m. peak hour**. Employee traffic is divided into two categories:

- ramp operation employees (80% of workforce), with 2 shifts changing at 7 a.m. and 7 p.m.
- remaining employees (20% of workforce), with 3 shifts changing at 7 a.m., 3 p.m. and 11:00 p.m.

Warehousing/Distribution - Trip rates are based on ITE equations (land use code 150), not average rates.

Appendix C:
Conceptual Cost Estimates for Alternatives

Appendix C: Conceptual Cost Improvements for Alternatives

Estimates for Initial Alternatives

Rough preliminary cost opinions were developed for the five initially modeled alternatives, to provide order-of-magnitude cost ranges associated with off-site infrastructure improvements in the early stages of the study. Several key assumptions underlay these cost estimates:

- A “low end” new interchange at I-35/Waverly Road/199th Street could be in the \$10-\$12 million range, while the “high end” could be as much as \$20 million. For preliminary purposes, an interchange cost of \$15 million was used.
- Typical roadway sections assumed for new and improved roadways are rural 2-lane configurations with 12-foot lanes and 8-foot full-depth shoulders. Although the Cities or County may have four-lane sections in their long-range plans, two-lane improvements were used as a base assumption.
- New and improved roadways would be 12-inch Portland cement concrete on 6-inch granular sub-base.

Table C-1 summarizes the preliminary cost estimates. As the table indicates, costs range from \$20 million (Alternative 5) to \$35 million (Alternative 4). These costs were heavily dependent on the assumptions listed above.

Estimate for Final Alternative

Based on the improvements recommended in Section 7, a revised cost estimate was developed. This estimate was more informed than the earlier estimates, in the sense that the model results had been developed and analyzed. Several improvements that had not been previously contemplated in the initial alternatives were included in the final recommendations, including significant improvements to the I-35/Gardner Road interchange, and widening several key arterials to four lanes. Table C-2 illustrates the resulting cost estimate, which totals to \$66.5 million.

Table C-1: Preliminary Cost Estimates for Alternatives (2005 \$)

	Unit cost	Original Alternative Cost Estimates									
		1		2		3		4		5	
		Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost	Qty	Cost
Waverly Road Reconstruction											
Roadway, l.f.	\$500	--	--	8,500	\$4,250,000	13,600	\$6,800,000	13,600	\$6,800,000	4,100	\$2,050,000
New bridges, s.f.	\$90	--	--	--	--	18,000	\$1,620,000	18,000	\$1,620,000	18,000	\$1,620,000
Four Corners Road											
Roadway, l.f.	\$500	13,600	\$6,800,000	--	--	--	--	2,700	\$1,350,000	--	--
New bridges, s.f.	\$90	32,000	\$2,880,000	--	--	--	--	32,000	\$2,880,000	--	--
White Drive Crossing*											
Roadway, l.f.	\$500	1,800	\$900,000	1,800	\$900,000	1,800	\$900,000	1,800	\$900,000	1,800	\$900,000
New bridges, s.f.	\$90	11,500	\$1,035,000	11,500	\$1,035,000	11,500	\$1,035,000	11,500	\$1,035,000	11,500	\$1,035,000
199th Street Reconstruction											
Roadway, l.f.	\$500	--	--	5,100	\$2,550,000	3,200	\$1,600,000	3,200	\$1,600,000	--	--
New bridges, s.f.	\$90	--	--	7,000	\$630,000	--	--	--	--	--	--
New Interchange - I-135											
New interchange, l.s.	\$15,000,000	1	\$15,000,000	1	\$15,000,000	1	\$15,000,000	1	\$15,000,000	--	--
US-56 Realignment											
Roadway, l.f.	\$500	6,700	\$3,350,000	4,900	\$2,450,000	--	--	6,700	\$3,350,000	--	--
Center Street Improvements											
Roadway, l.f.	\$500	1,700	\$850,000	1,700	\$850,000	--	--	--	--	1,700	\$850,000
New bridges, s.f.	\$90	5,500	\$495,000	5,500	\$495,000	--	--	--	--	5,500	\$495,000
Gardner Road Widening											
Roadway, l.f.	\$500	--	--	--	--	--	--	--	--	1,300	\$650,000
Bridge widening, s.f.	\$90	--	--	--	--	--	--	--	--	13,000	\$1,170,000
191st Street Reconstruction											
Roadway, l.f.	\$500	3,400	\$1,700,000	--	--	--	--	1,000	\$500,000	16,400	\$8,200,000
Railroad bridge, l.f.	\$12,000	--	--	--	--	--	--	--	--	260	\$3,120,000
Totals			\$33,000,000		\$28,200,000		\$27,000,000		\$35,000,000		\$20,100,000

Note: Cost estimates were developed in absence of detailed plans, and are based on previous recent planning studies conducted by HDR under the direction of KDOT.

* The White Street grade separation assumes a two-lane bridge over the tracks. This concept will ultimately need to be refined in order to improve cost accuracy.

Table C-2:
Preliminary Cost Estimates Recommended Alternative (2005 \$)

	Unit cost	Qty	Cost
Waverly Road Reconstruction			
Roadway, l.f.	\$1,500	16,000	\$24,000,000
New bridges, s.f.	\$90	36,000	\$3,240,000
199th Street Reconstruction			
Roadway, l.f.	\$500	1,845	\$922,500
New bridges, s.f.	\$90	13,700	\$1,233,000
New I-35 Interchange			
New interchange, l.s.	\$15,000,000	1	\$15,000,000
Improve I-35/Gardner Intchg			
Modify interchange, l.s.	\$10,000,000	1	\$10,000,000
US-56 Realignment			
Roadway, l.f.	\$500	4,500	\$2,250,000
New bridges, s.f.	\$90	6,700	\$603,000
Center Street Improvements			
Roadway, l.f.	\$500	1,700	\$850,000
New bridges, s.f.	\$90	5,500	\$495,000
191st Street Reconstruction			
Roadway, l.f.	\$1,500	5,300	\$7,950,000
Totals			\$66,500,000